WORK PLAN

FOR

WATERSHED PROTECTION, FLOOD PREVENTION, AND DRAINAGE

KINDER WATERSHED

Allen and Jefferson Davis Parishes, Louisiana

WATERSHED WORK PLAN

KINDER WATERSHED

Allen and Jefferson Davis Parishes, Louisiana

Prepared under the Authority of the Watershed Protection and Flood Prevention Act (Public Law 566, 83d Congress, 68 Stat. 666), as amended

Prepared by:

Calcasieu Soil and Water Conservation District

Gulf Coast Soil and Water Conservation District

Allen Parish Police Jury

Kinder Drainage District No. 2

Jefferson Davis Parish Police Jury

Jefferson Davis Parish Consolidated Gravity
Drainage District No. 1

With assistance by:

United States Department of Agriculture
Soil Conservation Service
Forest Service

United States Department of the Interior
Fish and Wildlife Service

State of Louisiana
Wild Life and Fisheries Commission
Department of Public Works

January 1975

KINDER WATERSHED

Louisiana

ADDENDUM

to the

WATERSHED WORK PLAN

Phase-In of Principles and Standards for
Planning Water and Related Land Resources

January 1975

KINDER WATERSHED

Louisiana

CONTENTS OF ADDENDUM

KINDER WATERSHED

Louisiana

Section 1 - Benefit-Cost Ratio of the Selected Alternative

On the basis of a discount rate of 5.875 percent the total average annual benefits of this project are $626,500. Average annual benefits excluding secondary benefits are $536,400. Based upon 1974 construction cost, the average annual project cost is $147,200. The benefit cost ratio including secondary benefits is 4.3:1, and the ratio excluding secondary benefits is 3.6:1.

SELECTED ALTERNATIVE
NATIONAL ECONOMIC DEVELOPMENT ACCOUNT
Kinder Watershed, Louisiana

Components	Measure of Effects 1/ ----- Dollars -----
Beneficial effects:	
A. The value to users of increased outputs of goods and services	
1. Flood prevention	270,900
2. Drainage	250,100
3. Utilization of unemployed and underemployed labor resources	
a. Project construction	12,100
b. Operation, Maintenance, Replacement	3,300
Total Beneficial effects	536,400

Components	Measures of Effects 1/ ------Dollars------
Adverse Effects:	
A. The value of resources required for a plan	
1. Channel work with appurtenant structures	
Project installation	102,700
Project administration	12,900
OM and Replacement	27,300
Total adverse effects	142,900
Net beneficial effects	393,500

1/ Average annual

SELECTED ALTERNATIVE
REGIONAL DEVELOPMENT ACCOUNT
Kinder Watershed, Louisiana

Components	State of Louisiana	Rest of Nation
	Measures of Effects 1/ ---- Dollars ----	
Income:		
Beneficial effects:		
A. The value of increased output of goods and services to users residing in the region		
1. Flood prevention	270,900	
2. Drainage	250,100	
3. Utilization of unemployed and underemployed labor resources		
a. Project construction	12,100	
b. Operation, Maintenance, Replacement	3,300	
B. **Secondary**	90,100	
Total beneficial effects	626,500	

Components	State of Louisiana	Rest of Nation
	Measures of Effects 1/ ---- Dollars ------	
Income:		
Adverse effects:		
A. The value of resources contributed from within the region to achieve the outputs		
1. Multiple-purpose drainage and flood prevention structures		
Project installation	50,900	51,800
Project administration	700	12,200
OM&R	27,300	
Total Adverse Effects	78,900	64,000
Net Beneficial Effects	547,600	-64,000

1/ Average Annual

SELECTED ALTERNATIVE
REGIONAL DEVELOPMENT ACCOUNT (Continued)
Kinder Watershed, Louisiana

Components	Measures of Effects: State of Louisiana	Measures of Effects: Rest of Nation
Regional Economic Base and Stability		
Beneficial effects:	The project will reduce the flood hazard and improve drainage on 32,900 acres of cropland and pastureland. Average annual net farm income will increase by $500,200. The project will create 37 man-years of employment for a 3-year period and 1 job per year for operation and maintenance for the 50-year life of the project. Flood protection and improved drainage is essential to continued agricultural productivity and the prevention of loss of farm income in the watershed.	
Adverse effects:	---	---

SELECTED ALTERNATIVE
REGIONAL DEVELOPMENT ACCOUNT (Continued)
Kinder Watershed, Louisiana

Components	Measures of Effects: State of Louisiana	Measures of Effects: Rest of Nation
Employment		
Beneficial effects:		
A. Increase in number and types of jobs		
1. Employment for project construction	37 semi-skilled jobs for 3 yrs.	
2. Employment for OM&R	1 semi-skilled permanent job for 50 yrs.	
Total beneficial effects	37 semi-skilled jobs for 3 yrs. 1 semi-skilled annual permanent job for 50 years	

Components	Measures of Effects: State of Louisiana	Measures of Effects: Rest of Nation
Employment		
Adverse effects:		
A. Decrease in number and types of jobs	0	0
Total adverse effects	0	0
Net beneficial effects	37 semi-skilled jobs for 3 years 1 semi-skilled permanent annual job for 50 years	

SELECTED ALTERNATIVE
ENVIRONMENTAL QUALITY ACCOUNT
Kinder Watershed, Louisiana

Components	Measures of effects
Beneficial and adverse effects:	
A. Areas of natural beauty	1. Pecan and various species of oak trees planted as part of the project measure will increase aesthetic values.
	2. Spoil, spread and shaped according to design and upon revegetating, will present a pleasant appearance.
	3. Improved agricultural production as a result of the project will present attractive pastoral scenes.
	4. Excavate from one side of channel leaving opposite side in natural state.
	5. Leave selected trees on the channel berm and right of way to interrupt open clear view creating a varied scene of natural beauty.
B. Considerations for quality of water, land, and air resources	1. Sediment from sheet erosion over the entire watershed will be reduced from .97 ton per acre to .85 ton or 12.5 percent
	2. Turbidity will be decreased.
	3. During construction there will be a slight increase in air and water pollution.
	4. The reduction of sediment at the outlet of the watershed will reduce accordingly any pollution associated with sediment.
	5. Retention of soil by land treatment measures will offset the use of agricultural pesticides.
	6. Enhance fire protection on 38,850 acres of forested land through education on forest fire prevention
C. Biological resources and selected ecosystems	1. The value of 60 acres of Type 1 wetlands will be reduced as waterfowl feeding areas.
	2. Deer and squirrels will be affected by the loss of 168 acres of forest land habitat.
	3. Ninety acres of rabbit habitat will be lost by channel work.

SELECTED ALTERNATIVE
ENVIRONMENTAL QUALITY ACCOUNT (Continued)
Kinder Watershed, Louisiana

Components	Measures of effects
C. Biological resources and selected ecosystems (Continued)	4. Quail and dove habitat will be temporarily available on 317 additional acres in the early stages of plant succession along the channels.
	5. Pools totaling 36 acres of impounded water will create fish habitat supporting a standing crop of about 15 pounds fish per acre.
	6. Habitat for wading birds will also be created by these pools.
D. Irreversible or irretrievable commitment	1. Channels will preclude the use of 339 acres for any other purpose for the life of the project.
	2. The expenditure of capital and labor for project installation will irretrievable.

SELECTED ALTERNATIVE
SOCIAL WELL-BEING ACCOUNT
Kinder Watershed, Louisiana

Components	Measures of Effects
A. Life, Health, Safety	1. A 78.4-percent reduction in out-of-bank flow in the watershed will provide for an unrestricted flow of traffic. This will minimize traffic disruptions particularly for emergency vehicles, schoolbuses, commuters to work, and haulers of farm supplies and products during wet periods. There will be a reduction of standing pools of water from high water that would otherwise be unsanitary. Contaminated floodwater from sewage systems and animal and domestic wastes will be reduced. Future threats of displacement due to high water and threats of disease occurring at times of flooding will be minimized.

ENVIRONMENTAL QUALITY PLAN
(Abbreviated)

ENVIRONMENTAL PROBLEMS

Flooding and inadequate drainage adversely affect the quality of the human environment. Flooding of roads, streets, and yards in the town of Kinder and other rural residences causes surface water ponding, reduced trafficability, soggy ground conditions, inconveniences, and lower aesthetics.

Flooding causes roads to be impassable. People have to remove their shoes or wear rubber boots to get in or out of their automobiles. Children miss school because they have to wade through water to reach bus stops. Ponded water remaining after high water recedes becomes stagnant, and oftentimes odorous. Stagnant pools harbor mosquitoes and become potential sources of diseases. Often these pools become an attractive nuisance for children.

Floodwater seeps into sewerage lines in Kinder and overloads sewerage pumps. Excess water in the lines often causes manhole covers to be displaced, allowing contaminated water to flow overland and increase the potential for disease. When large areas are inundated, toilets fail to operate for periods up to 12 hours. In other rural areas, field lines become saturated, reducing the operating efficiency of toilets and causing field lines to "bleed" effluent to the surface. To avoid this problem some rural residences have open field lines which discharge raw sewage into surface ditches.

Debris such as leaves and twigs float on yards and have to be removed. Trash dumps and litter in the vicinity of channels at isolated road crossings cause unsightly scenes. Floodwaters spread this litter, further lowering the aesthetics of the area.

Gravel and dirt roads become dusty during periods of low rainfall. Traffic causes the dust to rise and pollute the air around residences along these roads. Heavy concentrations of dust settle on the trees and shrubs along the roads lowering the aesthetics and habitat quality.

The general public uses most of the 38,850 acres of forest in the watershed for hunting, picnicking, hiking, bird watching, and other dispersed recreational uses. The lack of roads to some of these areas, especially the Calcasieu River, limits their use for recreation.

Timber has been harvested from all the forest land at one time or another. Consequently, most trees which would have had greater scenic or historical value have been removed.

Wildfires have destroyed important stands of timber and wildlife habitat. These fires cause air pollution and remove vegetation which protects the soil from erosion. Fire occurrence for the years 1968 through 1973 showed an average of 1.5 percent annual burn, which far exceeds the small watershed goal of 0.20 percent.

Infestations of Southern pine beetle have destroyed stands of timber. Attempts to control this pest have caused disruption of the environment in areas where infestations have occurred.

Vegetative growth of crop and pasture plants is adversely affected by inadequate drainage and flooding. The plants are stunted, grow irregularly, have poor coloration, and produce low yields. The lower quantity of vegetative matter produced by these plants offers less protection from erosion. The plowing under of vegetative matter during the fall further aggravates the erosion problem. The average annual soil loss amounts to 0.97 ton per acre. The turbidity resulting from erosion lowers the aesthetics.

Fisheries in channels other than the Calcasieu River are limited by intermittent flow conditions, small channels, and poor water quality. Of the 91 miles of existing channels, 74 miles flow only during periods of surface runoff, and 17 have continuous flow through some seasons of the year, but little or no flow through other seasons. Channel bottom widths range from 3 feet to 30 feet and average about 8 feet. Turbidity caused by both sediment and chemicals attached to sediment particles lowers water quality.

The habitat for rabbits, quail, and small nongame wildlife species of terrestrial life has been reduced by changes in crop rotations from rice-pasture to rice-soybeans. The harvest of soybeans under the latter rotation removes important cover which would have been provided by the rice-pasture rotation. Management of some forests for pine timber production has lowered its value for wildlife because most den and mast-bearing trees are eliminated. Also a problem is the harvesting of some game animals at a rate faster than the natural rate of replenishment.

COMPONENT NEEDS

The environmental quality component needs of the watershed are to reduce flooding, improve drainage, reduce solid waste disposal problems, reduce dumping of trash and litter, reduce dust pollution from roads, increase accessibility to and preserve areas of natural beauty, reduce wildfires and insect infestations in forests, reduce erosion, improve fisheries, improve wildlife habitat, and reduce over-harvesting of game species.

PLAN ELEMENTS

Elements Which Would Be Installed Under Public Law 566

Work on 73 miles of channels would be required to increase channel capacity and thus reduce flooding and improve drainage. To install this work in a manner which would minimize damages to fish and wildlife would cost $1,922,400.

Conservation land treatment measures would be applied over the entire watershed. Measures to be applied include conservation cropping system, crop residue management, drainage mains and laterals, land smoothing, pasture and hayland planting and management, wildlife wetlands and upland habitat management, critical area planting, forest management, and fire contactor program. The cost of installing these measures would total about $944,100.

Elements Which Would Be Installed Under Institutional Arrangements Other Than Public Law 566

Work necessary to improve the fishery would require installation of structures for water control (weirs) which would change flow characteristics from ephemeral and intermittent to ponded. To establish such structures to maintain a minimum depth of 3 feet on 14 miles of channels would require about $1,000,000.

Strips in soybean and ricefields would be left unharvested to improve wildlife habitat. Subsidy payments necessary to offset the loss of leaving 5 percent of the grain crops unharvested would amount to $340,000 annually. This program would be administered by a group or agency with funds available for this purpose.

Timber stands should be improved under the multi-use concept through such practices as thinnings, improvement cuts, and regenerations. Prescribed burning would be followed to reduce wild forest fires. The Louisiana Forestry Commission and the U.S. Forest Service would administer this program.

Passing and enforcing ordinances against trash dumping would be necessary to reduce improper solid waste disposal. Signs would be placed at these locations stating that trash dumping is forbidden by law. Existing trash would be removed and sanitary dumps established at well suited locations.

Hard surfacing gravel and dirt roads would reduce dust pollution. Constructing access roads to less accessible resources would increase the recreational areas. This would cost an estimated $1,500,000 and would be accomplished by the Louisiana Department of Highways or the Allen Parish and Jefferson Davis Parish Police Juries.

An educational program and a more strenuous enforcement of present laws would be necessary to reduce over-harvesting of game species. This program would be administered by the Louisiana Wild Life and Fisheries Commission with educational assistance from other interested groups.

Areas of natural beauty would be preserved through work with the owner of the property. The Louisiana Forestry Commission or interested groups which recognize new areas would accomplish this.

Intensified research is needed to provide better control of the Southern pine beetle. The U.S. Forest Service or other appropriate agency would accomplish this. Present research projects are trying to develop improved pest management procedures which include evaluation of population levels, recognition of forest management practices which keep stands healthy and, therefore, more resistant to attack, and the use of biological controls and nonpersistent selective chemicals.

Adequate disposal systems at individual residences would be installed to reduce dumping raw sewage in ditches or channels. The Louisiana Department of Public Health would administer this program.

Improvement of internal drainage in Kinder would be accomplished by the town. This element is necessary in conjunction with the channel work to relieve problems in town.

SECTION 3

ENVIRONMENTAL EFFECTS

Areas of Natural Beauty

Improved drainage and reduced flooding in residential areas would improve the landscape. Shrubs and grasses would be healthier and debris deposition would be reduced.

Removal of existing trash and litter and prevention of any further dumping would improve the aesthetics of the landscape in the vicinity of channels at road crossings. The elimination of dust from gravel and dirt roads would eliminate the deposition of dust on grass, shrubs, automobiles, and buildings, thus presenting a cleaner, more pleasing appearance.

Preservation of two National Champion Big Trees would prevent further depletion of the more scenic resources of the forest. Reduction in forest fires would preserve green vegetation and protect wildlife habitat presently being destroyed. Stands of trees partially destroyed by the Southern pine beetle would regain their health and resume vigorous growth. This would reduce the need for large scale salvage cutting and burning of infested stands which despoils the natural beauty of these areas and wastes the productive capacity.

The improved drainage and flood prevention would allow better, more uniform growth of crops and grasses, presenting more pleasing pastoral scenes. Photosynthesis undergone by these plants would produce more oxygen.

Application of land treatment measures such as prescribed burning and woodland improvement would temporarily disrupt the scenic value of these areas, but would have a beneficial effect on a long-term basis. Installation of structural measures would temporarily bare the soil in construction areas. Planting of grasses and trees on these areas would reestablish vegetation soon after construction is complete.

Quality Consideration of Water, Air, and Land Resources

The application of land treatment measures would reduce erosion, which would conserve soil and reduce water turbidity. Installation of structures for water control (weirs) would increase water areas by about 50 acres. Hard-surfacing roads and reducing forest fires would reduce air pollution. Odors from areas where raw sewage is disposed would be eliminated.

Reduced flooding and better drainage would allow better use of natural resources presently committed to the production of food and fiber. A decrease in the number of replantings and the elimination of extra cultural practices would reduce the need for additional fuel, seed, and agricultural chemicals.

Improved methods for management and control of the Southern pine beetle would reduce the need to spray infested areas with insecticides. Burning of debris left from salvage operations of infested stands would also be reduced.

Turbidity would temporarily increase during project construction. Sediment generated by construction and delivered to the Calcasieu River would amount of 1,300 tons. About 150 acres of cropland, 187 acres of wooded channel banks, and 123 acres of forest land not presently occupied by channels would be temporarily disturbed by the project.

Construction of roads to the less accessible areas, especially the Calcasieu River, would make it more accessible for recreation but would possibly cause disruption for other forms of life.

Biological Resources and Selected Ecological Systems

Installation of land treatment practices for wildlife upland and wetland habitat management would improve habitat for wildlife. Leaving strips of unharvested rice and flooding the fields would provide food for migratory waterfowl. Leaving strips of unharvested soybeans would leave food and cover which is presently being eliminated. More strenuous enforcement of game hunting laws and an educational program would reduce the harvest of game to a rate more compatible with the rate of natural replenishment. Woodland improvement would eliminate the poorer trees, making room for the more productive trees to grow. Under improved harvesting and management practices, some of the better trees for mast production would be left. Biological control of the Southern pine beetle would reduce those disturbances to wildlife habitat.

Creation of 12 pools of ponded water with a minimum depth of 3 feet and minimum width of 20 feet would increase the present fishery in channels by 50 acres. Land treatment reducing sheet erosion by 12.5 percent would improve water quality. Tailwater of two pools would provide habitat for wading birds.

The reduced flooding and improved drainage would improve the living conditions in residential areas. People would take more pride in their homes. Inconveniences and unsanitary conditions caused by flooding would be reduced. Installation of better solid waste disposal systems would reduce the likelihood of water pollution from these sources.

Installation of the environmental quality plan would have adverse effects on some ecosystems. The food chain of aquatic populations would be temporarily disrupted during construction. Approximately 90 acres of rabbit habitat would be lost by the project. Deer and squirrel populations would be reduced by the loss of 168 acres of forest land habitat. Occasional periods of noxious aquatic weed growth would occur in the permanent pools of water.

Irreversible and Irretrievable Effects

Approximately 50 acres of land within ephemeral and intermittent flow channels would be committed to ponded water. The channel works would preclude the use of 339 acres of land for any other purpose for at least the life of the project. Dumps for trash disposal would require additional land. Although these resources are enumerated as irreversible and irretrievable commitments, technically these resources could be reclaimed by more elaborate systems.

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WATERSHED WORK PLAN AGREEMENT

between the

CALCASIEU SOIL AND WATER CONSERVATION DISTRICT
Local Organization

GULF COAST SOIL AND WATER CONSERVATION DISTRICT
Local Organization

ALLEN PARISH POLICE JURY
Local Organization

KINDER DRAINAGE DISTRICT NO. 2
Local Organization

JEFFERSON DAVIS PARISH POLICE JURY
Local Organization

JEFFERSON DAVIS PARISH CONSOLIDATED GRAVITY DRAINAGE DISTRICT NO. 1
Local Organization

(hereinafter referred to as the Sponsoring Local Organization)

State of Louisiana

and the

Soil Conservation Service
United States Department of Agriculture
(hereinafter referred to as the Service)

Whereas, application has heretofore been made to the Secretary of Agriculture by the Sponsoring Local Organization for assistance in preparing a plan for works of improvement for the Kinder Watershed, State of Louisiana, under the authority of the Watershed Protection and Flood Prevention Act (Public Law 566, 83d Congress; 68 Stat. 666) as amended; and

Whereas, the responsibility for administration of the Watershed Protection and Flood Prevention Act, as amended, has been assigned by the Secretary of Agriculture to the Service; and

Whereas, there has been developed through the cooperative efforts of the Sponsoring Local Organization and the Service a mutually satisfactory plan for works of improvement for the Kinder Watershed, State of Louisiana, hereinafter referred to as the watershed work plan, which plan is annexed to and made a part of this agreement;

AGREEMENT

Now, therefore, in view of the foregoing considerations, the Sponsoring Local Organization and the Secretary of Agriculture, through the Service, hereby agree on the watershed work plan, and further agree that the works of improvement as set forth in said plan can be installed in about 5 years.

It is mutually agreed that in installing and operating and maintaining the works of improvement substantially in accordance with the terms, conditions, and stipulations provided for in the watershed work plan:

1. The Kinder Drainage District No. 2 and the Jefferson Davis Parish Consolidated Gravity Drainage District No. 1 will acquire such land rights as will be needed in connection with the works of improvement. The percentages of this cost to be borne by the Sponsoring Local Organization and the Service are as follows:

Works of Improvement	Sponsoring Local Organization	Service	Estimated Land Rights Cost
	(percent)	(percent)	(dollars)
All structural measures	100	0	584,100

2. The Kinder Drainage District No. 2 and the Jefferson Davis Parish Consolidated Gravity Drainage District No. 1 assure that comparable replacement dwellings will be available for individuals and persons displaced from dwellings, and will provide relocation assistance advisory services and relocation assistance, make the relocation payments to displaced persons, and otherwise comply with the real property acquisition policies contained in the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Public Law 91-646, 84 Stat. 1894) effective as of January 2, 1971, and the Regulations issued by the Secretary of Agriculture pursuant thereto. The costs of relocation payments will be shared by the Sponsoring Local Organization and the Service as follows:

	Sponsoring Local Organization	Service	Estimated Relocation Payment Costs
	(percent)	(percent)	(dollars)
Relocation Payment	59	41	-0- 1/

1/ Investigation has disclosed that under present conditions the project measures will not result in the displacement of any person, business, or farm operation. However, if relocations become necessary, relocation payments will be cost-shared in accordance with the percentages shown.

3. The Kinder Drainage District No. 2 and the Jefferson Davis Parish Consolidated Gravity Drainage District No. 1 will acquire or provide assurance that landowners or water users have acquired such water rights pursuant to State law as may be needed in the installation and operations of the works of improvement.

4. The percentages of construction costs of structural measures to be paid by the Kinder Drainage District No. 2 and the Jefferson Davis Parish Consolidated Gravity Drainage District No. 1, as the Sponsoring Local Organization, and by the Service are as follows:

Works of Improvement	Sponsoring Local Organization	Service	Estimated Construction Cost
	(percent)	(percent)	(dollars)
Channel Work	25	75	1,050,400

5. The percentages of the engineering costs to borne by the Kinder Drainage District No. 2 and the Jefferson Davis Parish Consolidated Gravity Drainage District No. 1, as the Sponsoring Local Organization, and by the Service are as follows:

Works of Improvement	Sponsoring Local Organization	Service	Estimated Engineering Cost
	(percent)	(percent)	(dollars)
Channel Work	0	100	73,600

6. The Sponsoring Local Organization and the Service will each bear the costs of Project Administration which each incurs, estimated to be $11,600 and $202,700, respectively.

7. The Calcasieu and the Gulf Coast Soil and Water Conservation Districts will provide assistance to landowners and operators to assure the installation of the land treatment measures shown in the watershed work plan.

8. The Calcasieu and the Gulf Coast Soil and Water Conservation Districts will encourage landowners and operators to operate and maintain the land treatment measures for the protection and improvement of the watershed.

9. The Kinder Drainage District No. 2 and the Jefferson Davis Parish Consolidated Gravity Drainage District No. 1, as appropriate, will be responsible for the operation and maintenance of the structural works of improvement by actually performing the work or arranging for such work in accordance with agreements to be entered into prior to issuing invitations to bid for construction work.

10. The costs shown in this agreement represent preliminary estimates. In finally determining the costs to be borne by the parties hereto, the actual costs incurred in the installation of works of improvement will be used.

11. This agreement is not a fund-obligating document. Financial and other assistance to be furnished by the Service in carrying out the watershed work plan is contingent on the appropriation of funds for this purpose.

    A separate agreement will be entered into between the Service and the affected Sponsoring Local Organization before either party initiates work involving funds of the other party. Such agreement will set forth in detail the financial and working arrangements and other conditions that are applicable to the specific works of improvements.

12. The watershed work plan may be amended or revised, and this agreement may be modified or terminated only by mutual agreement of the parties hereto except for cause. The Service may terminate financial and other assistance in whole, or in part, at any time whenever it is determined that the Sponsoring Local Organization has failed to comply with the conditions of this agreement. The Service shall promptly notify the Sponsoring Local Organization in writing of the determination and the reasons for the termination, together with the effective date. Payments made to the Sponsoring Local Organization or recoveries by the Service under projects terminated for cause shall be in accord with the legal rights and liabilities of the parties. An amendment to incorporate changes affecting one specific structural measure may be made by mutual agreement between the Service and the Sponsor having specific responsibilities for the particular structural measure involved.

13. No member of or delegate to Congress, or resident commissioner, shall be admitted to any share or part of this agreement, or to any benefit that may arise therefrom; but this provision shall not be construed to extend to this agreement if made with a corporation for its general benefit.

14. The program conducted will be in compliance with all requirements respecting nondiscrimination as contained in the Civil Rights Act of 1964, and the regulations of the Secretary of Agriculture (7 C.F.R. 15.1-15.12), which provide that no person in the United States shall, on the ground of race, color, or national origin, be denied the benefits of, or be subjected to discrimination under any activity receiving Federal financial assistance.

AGREEMENT

15. This agreement will not become effective until the Service has issued a notification of approval and authorizes assistance.

CALCASIEU SOIL AND WATER CONSERVATION DISTRICT
Local Organization

By ______________

Title Chairman

Post Office Box 211
Leesville, Louisiana 71446
Address Zip Code

Date 2/20/75

The signing of this agreement was authorized by a resolution of the governing body of the CALCASIEU SOIL AND WATER CONSERVATION DISTRICT
Local Organization

adopted at a meeting held on February 20, 1975

____
Secretary, Local Organization

Post Office Box 211
Leesville, Louisiana 71446
Address Zip Code

Date 2/20/75

GULF COAST SOIL AND WATER CONSERVATION DISTRICT
Local Organization

By ______________

Title Chairman

Post Office Box 1238
Lake Charles, Louisiana 70604
Address Zip Code

Date 2-14-75

The signing of this agreement was authorized by a resolution of the governing body of the GULF COAST SOIL AND WATER CONSERVATION DISTRICT
Local Organization

adopted at a meeting held on Thursday, Feb. 13, 1975

____
Secretary, Local Organization

Route 3, Box 55
Lake Charles, Louisiana 70601
Address Zip Code

Date 2-14-75

AGREEMENT

ALLEN PARISH POLICE JURY
Local Organization

By Lray Duplechian

Title President

Post Office Drawer G
Oberlin, Louisiana 70655
Address Zip Code

Date 2/13/75

The signing of this agreement was authorized by a resolution of the governing body of the ALLEN PARISH POLICE JURY
Local Organization
adopted at a meeting held on Feb. 13, 1975

Robert L. Brooks
Secretary, Local Organization

Courthouse Building
Oberlin, Louisiana 70655
Address Zip Code

Date 2-13-75

KINDER DRAINAGE DISTRICT NO. 2
Local Organization

By Lloyd Manuel

Title Chairman

Post Office Box 6487
Reeves, Louisiana 70658

Date FEB 13, 1975

The signing of this agreement was authorized by a resolution of the governing body of the KINDER DRAINAGE DISTRICT NO. 2
Local Organization
adopted at a meeting held on February 13, 1975

A. Ray Miller
Secretary, Local Organization

Reeves, Louisiana 70658
Address Zip Code

Date FEB 13, 1975

AGREEMENT

JEFFERSON DAVIS PARISH POLICE JURY
Local Organization

By [signature]

Title President

Courthouse Building
Jennings, Louisiana 70546
Address Zip Code

Date 2/26/75

The signing of this agreement was authorized by a resolution of the governing body of the JEFFERSON DAVIS PARISH POLICE JURY
Local Organization
adopted at a meeting held on Wed. Fev 26 1975

[signature]
Secretary, Local Organization

Courthouse Building
Jennings, Louisiana 70546
Address Zip Code

Date Fev 26, 1975

JEFFERSON DAVIS PARISH CONSOLIDATED GRAVITY DRAINAGE DISTRICT NO. 1
Local Organization

By [signature]

Title Chairman

Route 1, Box 106
Elton, Louisiana 70532
Address Zip Code

Date 2-25-75

The signing of this agreement was authorized by a resolution of the governing body of the JEFFERSON DAVIS PARISH CONSOLIDATED GRAVITY DRAINAGE DISTRICT NO. 1
Local Organization
adopted at a meeting held on Tuesday, Feb. 25, 1975

[signature]
Secretary, Local Organization

Post Office Box 547
Welsh, Louisiana 70591
Address Zip Code

Date 2-25-75

AGREEMENT

Appropriate and careful consideration has been given to the environmental statement prepared for this project and to the environmental aspects thereof.

Soil Conservation Service
United States Department of Agriculture

Approved By:

Alton Mangum
State Conservationist

February 27, 1975
Date

WATERSHED WORK PLAN

KINDER WATERSHED

Allen and Jefferson Davis Parishes, Louisiana

January 1975

SUMMARY OF PLAN

The watershed is in the southwestern part of Louisiana. It contains 84,000 acres (131 square miles), of which 75,600 acres are in Allen Parish and 8,400 acres are in Jefferson Davis Parish. Approximately 43 percent of the area is cropland, 1 percent is pastureland, 46 percent is forest land, and 10 percent is in other uses. The local Sponsors are the Allen Parish Police Jury, Kinder Drainage District No. 2, Jefferson Davis Parish Police Jury, Jefferson Davis Parish Consolidated Gravity Drainage District No. 1, Calcasieu Soil and Water Conservation District, and Gulf Coast Soil and Water Conservation District. Technical assistance in preparation of the work plan was furnished by the Soil Conservation Service and the Forest Service of the U.S. Department of Agriculture, Fish and Wildlife Service of the U.S. Department of the Interior, the Wild Life and Fisheries Commission and the Department of Public Works of the State of Louisiana.

The principal problems on cropland and pastureland are flooding and inadequate drainage, which are generally inseparable because of the flat terrain. Frequent inundation and prolonged wetness cause untimely planting and cultivation of crops, increased production costs, and lower yields and quality. The land, having a moderate production potential, needs a comprehensive system of channels to provide the needed drainage and flood prevention. The present hydrologic condition of the watershed is generally poor due to wet conditions and slowly permeable soils. This condition in the forest land is made worse by high fire occurrence and poor management of the forest stands on private land. The purposes of this project are watershed protection, flood prevention, and drainage.

Analyses of various levels of protection by evaluation units were conducted. The alternative which generally provides a 3-year level of flood protection and drainage to agricultural land was chosen for the planned project. This level of protection does not eliminate all out-of-bank flow from the 3-year storm. It limits the duration of flooding from such a storm to 24 hours or less on land above the design water surface in adjacent project channels. Flooding damages will be reduced by about 73 percent.

SUMMARY

A total of 83 miles of existing channels was investigated; about 8 miles were determined ineligible for inclusion; about 12 miles were found to be adequate for the 3-year level of protection under present conditions; and about 63 miles will require work. About 8 miles will be cleared and 55 miles will be enlarged. The 20 miles of channel investigated but not included were mainly in forested areas that are important from an environmental standpoint and could be eliminated without adversely affecting drainage of cropland and pastureland. An additional 10 miles of new channels are needed. This will result in a project total of about 73 miles of channel work.

Of the total 73 miles of channel work, about 63 miles (86 percent) have ephemeral flow and about 10 miles (14 percent) have intermittent flow; about 63 miles (86 percent) are manmade or previously modified and 10 miles (14 percent) are nonexisting or have practically no defined channels.

About 430 persons in farm households will benefit from the increased income generated by the project. The other 3,970 watershed residents, as well as residents of surrounding areas, will benefit from the increased volume of business generated by the higher incomes and the decreased flooding.

About 841 acres of land will be disturbed for the installation of all channel work and appurtenances. This includes 381 acres already in rights-of-way, 150 acres of cropland, 187 acres of wooded channel banks, and 123 acres of forest land. The disturbances will result in decreases for most forest wildlife species and increases for most open land wildlife species.

The installation of six structures for water control (weirs) will be beneficial to the aquatic ecosystem, will lower maintenance cost of channels, and will provide an additional source of water for agricultural purposes. The weirs will provide 36 acres of additional permanent water.

The work plan proposes an installation period of 3 years for structural measures and 5 years for land treatment measures. The total installation cost is estimated to be $2,866,500 of which Public Law 566 funds will bear $1,177,200 (about 41 percent), and other funds will bear the remaining $1,689,300 (about 59 percent).

Landowners and operators cooperating with the Calcasieu and the Gulf Coast Soil and Water Conservation Districts and the Louisiana Forestry Commission will install land treatment measures on individual farms that reduce floodwater and sediment damages and improve drainage conditions. The installation and proper functioning of the land treatment measures are dependent to a large extent on adequate outlets to be provided by project channels. The cost of these land treatment measures is estimated to be

$944,100, of which Public Law 566 funds will provide $113,100 and other funds will provide $831,000. Landowners and operators with aid from Federal and State programs will bear the cost of applying land treatment measures. The estimated cost of structural measures is $1,922,400, of which Public Law 566 will bear $1,064,100 and other funds will bear $858,300.

Average annual benefits amount to $626,500. This includes an estimated $90,100 of annual secondary benefits. The average annual cost, including amortization of installation cost plus operation and maintenance, is $142,900. The benefit-cost ratio is 4.4 to 1.

Landowners and operators will maintain land treatment measures on their farms. The Kinder Drainage District No. 2 and the Jefferson Davis Parish Consolidated Gravity Drainage District No. 1 will maintain structural measures. Estimated annual operation and maintenance cost of structural measures based on current prices is $27,300.

The Louisiana Department of Public Works has agreed to share in the local cost of the structural measures contingent on the appropriation of funds for this purpose by the Louisiana Legislature. The Sponsors recognize additional funds may be needed to finance project installation and will be responsible for obtaining additional financing as necessary.

WATERSHED RESOURCES-ENVIRONMENTAL SETTING[1/]

Physical Data

The Kinder Watershed is in southwest Louisiana. It encompases approximately 84,000 acres of which 75,600 acres are in south-central Allen Parish and 8,400 acres are in northeastern Jefferson Davis Parish.

Kinder (population 2,300) is the only town in the watershed. It is located at the intersection of U.S. Highways 165 and 190. Elton, a small town with a population of approximately 1,600, is about 2 miles east of the watershed along U.S. Highway 190. Oberlin, the Allen Parish seat, and Oakdale, the largest town in the parish, are located about 1 mile and 16 miles, respectively, northeast of the watershed boundary along U.S. Highway 165. Lake Charles, the fourth largest city in the State, is located 35 miles to the southwest of the watershed boundary along U.S. Highway 90 and Interstate Highway 10.

The watershed is in the Calcasieu River subregion of the lower Mississippi Region.[2/] It is fairly typical of other flatland watersheds in the subregion.

The west side of the watershed has gentle slopes that become level and nearly level in the eastern and southern portions. About 65 percent of the watershed is in the Gulf Coast Prairie Land Resources Area. The remaining 35 percent is in the Southern Coastal Plain Land Resources Area. Elevations range from 30 to 90 feet above mean sea level in the Southern Coastal Plain and from 30 to 50 feet above mean sea level in the Gulf Coast Prairie Land Resource Areas.[3/] The original cover was dense, pine-hardwood forest in the Southern Coastal Plain and tall grass and scattered brush in the Gulf Coast Prairie.

1/ All information and data, except as otherwise noted by reference to source, were collected or compiled during watershed planning investigation by the Soil Conservation Service and Forest Service, U.S. Department of Agriculture.

2/ U.S. Department of Agriculture, Soil Conservation Service, Atlas of River Basins of the United States, 2nd ed. (Washington: U.S. Government Printing Office, 1970) Map No. 15.

3/ U.S. Department of Agriculture, Soil Conservation Service, Land Resource Regions and Major Land Resources Areas of the United States, Agriculture Handbook No. 296 (Washington: U.S. Government Printing Office, 1965), p. 69.

As a basis for conservation planning, the soils of the watershed are grouped in accord with the soil capability classification system. Capability grouping shows, in a general way, the suitability of soils for most kinds of field crops.

Capability Classes, the broadest group, are designated by Roman numberals I through VIII. In Class I are soils that have few limitations, the widest range of use, and the least risk of damage when they are used. The soils in the other classes have progressively greater natural limitations. In Class VIII are soils and landforms so rough, so shallow, or otherwise so limited that they do not produce worthwhile yields of crops, forage, or wood products. Classes I, II, and III are suitable for cropland, Class IV is marginal for cropland, and Classes V-VIII are unsuited for cropland.4/

Capability Subclasses are soil groups within one class; they are designated by adding a small letter, "e" or "w," to the class numeral, for exapmle, IIw. The letter "e" shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; "w" shows that water in or on the soil interferes with plant growth or cultivation.5/

The principal soil associations are Acadia-Wrightsville, Crowley-Mowata, and Caddo-Beauregard. Bibb-Mantachie and Bowie-Ruston are present, but to a lesser extent.6/ See General Soil Map on the following page.

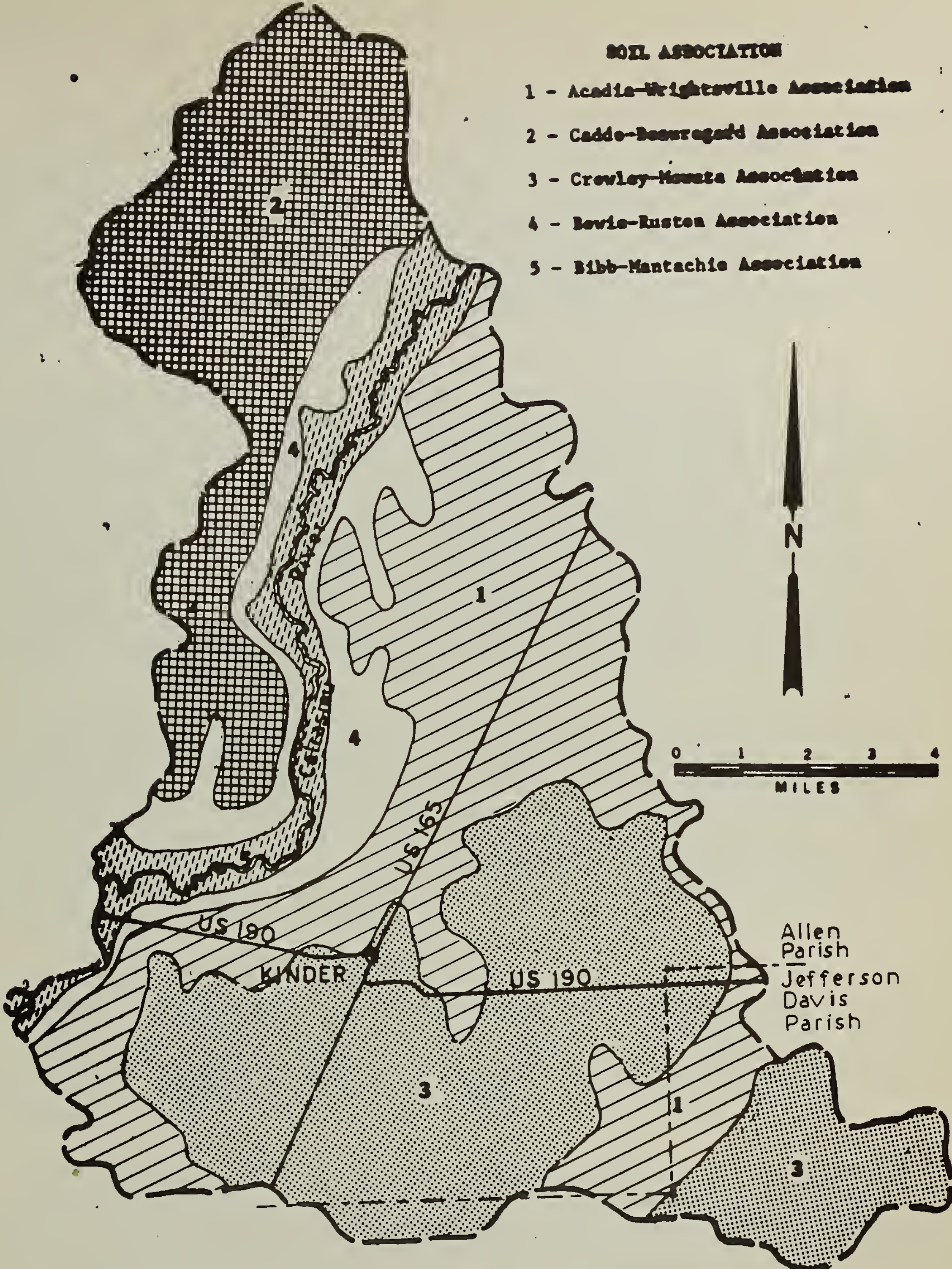
The Acadia-Wrightsville Association, covering about 30 percent of the watershed, is composed of level to very gently sloping, upland soils. They have a silty loam surface layer and clayey subsoils. Acadia soils are somewhat poorly drained. Wrightsville soils occur on broad flats and depressed areas. Most of these soils are in Capability Class IIIw. Both of these soils have low fertility, but if properly drained and fertilized, will produce high crop yields. The Acadia and Wrightsville soils have forest land site indices7/ of 86 and 80, respectively, for loblolly pine.

4/ U.S. Department of Agriculture, Soil Conservation Service, Land Capability Classification, Agriculture Handbook No. 210 (Washington: U.S. Government Printing Office, 1961) pp. 6-10.

5/ *Ibid.*, pp. 10-11.

6/ U.S. Department of Agriculture, Soil Conservation Service, "Allen Parish" and "Jefferson Davis Parish," General Soil Map. (Fort Worth: Cartographic Unit, South Regional Technical Service Center, 1971).

7/ Forest land site index is the height in feet of the tallest trees (dominants and codominants) in normal stands at 50 years of age.



General Soil Map
Kinder Watershed
Allen and Jefferson Davis Parishes, Louisiana
U. S. Department of Agriculture
Soil Conservation Service
Alexandria, Louisiana

Compiled from SCS General Soil Maps of
Allen and Jefferson Davis Parishes

April 1974

The Crowley-Mowata Association, about 34 percent of the watershed, is composed of level to depressed, upland soils. They have a silt loam surface layer and clayey subsoils. The somewhat poorly-drained Crowley soils are level or nearly level. The poorly-drained Mowata soils are level or depressed. Most of these soils are in Capability Class IIIw and will produce high crop yields if properly drained and fertilized. Although the Crowley and Mowata soils are seldom used for forest, they have forest-land site indices of 90 and 87, respectively, for loblolly pine.

The Caddo-Beauregard Association, about 19 percent of the watershed, is composed of level to very gently sloping, upland soils. The poorly-drained Caddo soils are level or depressed. The moderately well-drained Beauregard soils are nearly level or gently sloping. Caddo and Beauregard soils are loamy throughout. Most soils in the association are in Capability Class IIIw with lesser amounts of IIw or IIe. Capability Class IIw and IIe soils make up about 24 percent of the association and are used mostly for forest land. Crops grown on Caddo soils have poor to fair response to fertilizers while on Beauregard soils they have a fair response. Caddo and Beauregard soils have forest-land site indices of 90 and 92, respectively, for loblolly pine.

The Bowie-Ruston Association, about 10 percent of the watershed, is composed of gently sloping, upland soils that are moderately well to well-drained. Capability Class IIIe and IIe are dominant. These soils have low fertility and erode easily if used for cultivated crops. However, crops respond well to fertilizers and erosion can be reduced by good management. Forest is the main land use on these soils. The Bowie and Ruston soils have forest-land site indices of 83 and 91, respectively, for loblolly pine.

The Bibb-Mantachie Association, about 7 percent of the watershed, is composed of level soils of the Calcasieu River flood plain. They are subject to frequent flooding. The soils are in Capability Class Vw. They are loamy throughout and have poor natural drainage. Because of the severe flooding and poor drainage, most of these soils are in forest land.

The Montgomery Terrace and the Prairie Terrace (two Pleistocene Formations) and recent flood-plain deposits constitute the formations located at the surface.[8/] The Montgomery Formation is located primarily in the area west of the Calcasieu River, while the Prairie Formation is located to the east of the river and in a narrow belt west of the river. Recent deposits are found in the flood plain of the river.

Soils of the older Montgomery Formation generally show less clay in the surface and upper subsoil than the soils of the Prairie Formation.

8/ Rufus J. LeBlanc, Geologic Map of Louisiana (a map compiled from several sources of data, Baton Rouge, Louisiana, 1948).

The slope of the Montgomery Terrace is generally about 3 feet per mile, while the Prairie usually has a slope of about 2 feet per mile.

The average annual rainfall is about 60 inches with approximately 28 inches occurring during the growing season (April to September). The rainfall is usually well distributed throughout the year, but heavy rainfall may occur at any time. Mean temperatures range from 83 degrees Fahrenheit in July to 53 degrees in January.9/ The average frost-free period of 254 days extends from March 2 to November 11.10/

Oil and gas are the only mineral resources of the watershed area. The largest and oldest producing field in Allen Parish is located east of the watershed. The first well was completed in 1939. Since that time, 15 other oil and gas fields have been discovered in the parish. Of the 15 fields, 4 and a portion of another are located in the watershed. Production is from the Catahoula and Wilcox Formations. A gravel pit exists about 3 miles to the southwest of the watershed. No commercial clay or gravel deposits are known to exist within its boundaries.

Ground water is obtained from the Chicot Aquifer of the Pleistocene Age and the Evangeline Aquifer of Pliocene Age. The town of Kinder obtains its water from three wells, two of which produce from the Evangeline Aquifer and one from the Chicot Aquifer. Irrigation water is obtained from the Chicot Aquifer. About 55.67 million gallons of water per day were pumped for irrigation in Allen Parish during 1969.11/ The watershed is part of the recharge area for the Chicot Aquifer. The Calcasieu River is a prime recharge stream in this area. Approximately 50 percent of the recharge area has less than 50 feet of clay overlying the aquifer and the remainder of the area has between 50 to 100 feet of clay. Because of this clay overlay, shallow channels do not contribute significantly to the recharge of the aquifer.

9/ U.S. Department of Agriculture, Forest Service, A Forest Atlas of the South (Southern Forest Experiment Station - New Orleans, Louisiana and Southeastern Forest Experiment Station - Asheville, North Carolina, 1969), pp. 22-23.

10/ U.S. Department of Agriculture, Climate and Man - 1941 Yearbook of Agriculture (Washington: U.S. Government Printing Office, 1941), pp. 900-901.

11/ State of Louisiana, Department of Conservation, Pumpage of Water in Louisiana, Water Resources Pamphlet No. 26 (Baton Rouge: Louisiana Geological Survey and Louisiana Department of Public Works, 1970) p. 8.

The present land use and percent distribution is:

Land Use	Acres	Percent
Cropland	35,700	43
Pastureland	1,200	1
Forest Land	38,850	46
Other[a/]	8,250	10
Total	84,000	100

a/ Includes roads, railroads, channels, rivers, communities, farmsteads, rights-of-way, etc.

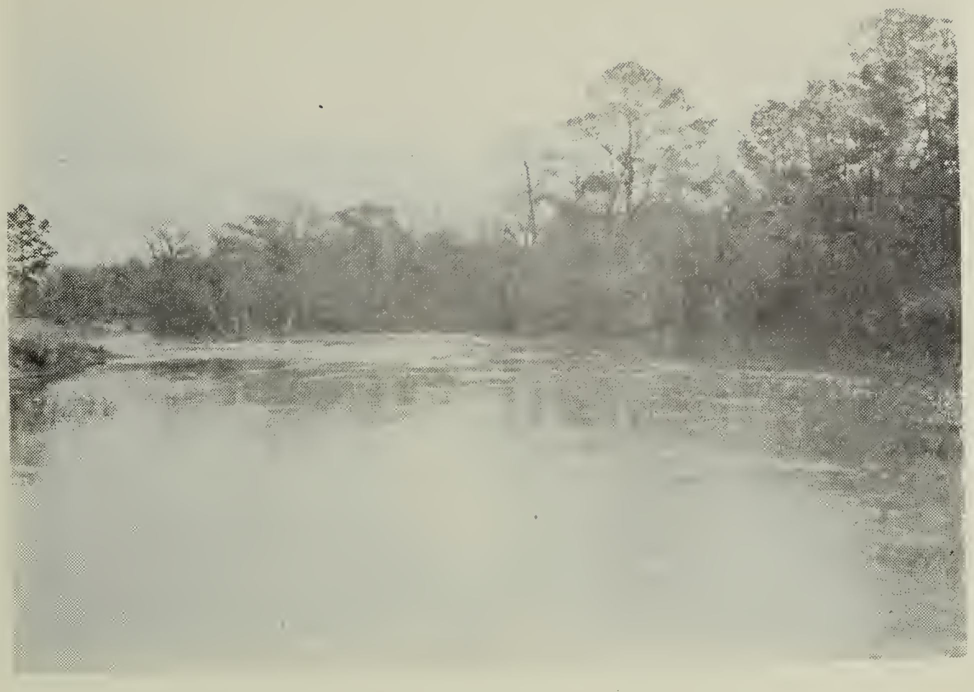
Crops grown consist mostly of rice and soybeans. Pasture consists of Common bermudagrass, dallisgrass, carpetgrass, fescue, bahiagrass, ryegrass, and small grains including wheat and oats.

The forest land consists of three plant communities: (1) bottom land hardwood, (2) mixed pine-hardwood, and (3) planted pine. The bottom land hardwood plant community is located mainly along the Calcasieu River. An example of this community is exhibited by the lower picture on page 10. The overstory vegetation in the bottom land hardwood plant community contains cypress, tupelo gum, green ash, red maple, magnolia, willow oak, overcup oak, and water oak. Understory vegetation includes blackberry, greenbrier, Common buttonbush, hawthorn, ferns, grasses, forbs, and reproduction from overstory species. The only natural area which occurs is in this plant community. This natural area is in the climax stage of plant succession and is in the flood plain of the Calcasieu River. It would include the majority of the Type 1 wetlands (seasonally flooded hardwoods).

Overstory vegetation in the mixed pine-hardwood plant community includes loblolly and longleaf pine, white oak, Southern red oak, blackjack oak, sweetgum, persimmon, magnolia, and blackgum. Understory vegetation consists of dewberry, waxmyrtle, wild grape, arrowwood, blackberry, American beautyberry, huckleberry, Yellow jessamine, Japanese honeysuckle, sweet bay, day flower, asters, goldenrod, sumac trumpetcreeper, and grasses including pine hill bluestem, switchgrass, slender bluestem, cutover muhly, low panicums, and paspalums.

The overstory vegetation in the planted pine community consists of slash pine. Understory vegetation is similar to that described for the mixed pine-hardwood plant community, but is not as abundant because of the canopy conditions.

Plant communities under the "other" land use consist of transitional and aquatic vegetation. Transistional vegetation occurs along the edges or borders where forest land and open land meet. Transitional vegetation is a mixture of species common to the overstory, understory, and open land. This situation exemplifies the "edge effect" which is very productive to wildlife habitat.



Calcasieu River at U.S. Highway No. 190 Bridge

Typical Flood-Plain Forest Land of the Calcasieu River

Natural Depression which has been Dug and is Referred to Locally as a "Drainage Ditch"

Manmade "Drainage Ditch"

Aquatic vegetation in and along the edges of the farm ponds includes water hyacinth, duckweed, cattail, water primrose, yellow waterlily, pond weeds, various algae, and phytoplankton. Aquatics growing in and along the edges of the larger channels include cattail, smartweeds, water primrose, spikerush, alligator weed, fall panicum, horne beakrush, and lizardtail. Various algae and phytoplankton occur in the Calcasieu River.

Basal areas range from 50 to 170 square feet per acre with an average of about 80 in the industrial and leased forest lands. Basal area is the area of a tree expressed in square feet at 4.5 feet above ground. Most of the forest land is well stocked. Site index ranges from 80 to 100 feet, giving these lands the potential to grow from 300 to 500 board feet of wood per acre per year. Most of the forest land is currently growing 150 board feet per acre per year.

Wildfires occur periodically on the forested portion of the watershed and have contributed to a poor hydrologic conditions by removing the litter from the soil surface.

Stream classification excluding the Calcasieu River shows that there are about 19 miles of channels which are classed unmodified, well-defined, natural streams. These are in forested areas near the Calcasieu River and near or in its flood plain. The remaining channels consist of 72 miles classified as manmade or previously modified and about 10 miles which are classified as nonexistent or practically undefined. Of the 91 miles of existing channels, 74 have ephemeral flows and 17 have intermittent flows. The only perennial stream is the outlet, Calcasieu River. The upper picture on page 10 shows the river at the U.S. Highway 190 Bridge. It flows in a southwesterly direction.

The general drainage pattern for channels east of the Calcasieu River is south and then west. The channels west of the Calcasieu River generally drain in a southeasterly direction.

The drainage system consisted of a pattern of bayous and natural depressions before the area was settled by the pioneers. As the cultivation of crops was undertaken, a drainage improvement program was initiated which included installing manmade "ditches" and enlarging and clearing many of the natural water courses. Most of the channels that comprise the present system of outlets have been dug, and in most cases, more than once. The geometric configuration and alignment of these natural depressions have been altered. Cleaning of these ditches for the past 50 years has resulted in the present outlet system of manmade "drainage ditches." The photographs on page 11 show two typical "drainage ditches."

The principal channels with their laterals and other smaller channels were divided into six groups for inventory purposes. These are shown on the following page.

Group	Channels
I	Channel M-1 and its laterals
II	Channels M-3 and M-4
III	Channel M-2 and its laterals
IV	Channels M-5 and M-6 and their laterals
V	Channel M-7 and its lateral
Other	All remaining channels

The Louisiana Stream Control Commission has described portions of interstate streams, coastal waters, and streams discharging into coastal waters in the State according to present use. The Commission has also established quality standards which will apply to these streams and their intrastate navigable tributaries and water bodies. Calcasieu River is the only stream classified by the Commission which is applicable to this watershed. The complexity of this aquatic ecosystem has resulted in the Commission's dividing the river into three zones. Zone 1 is applicable to this watershed project and is defined as that portion of the river from its origin to Calcasieu River saltwater barrier. The saltwater barrier is located about 30 miles south of the watershed boundary. The present uses of Calcasieu River in Zone 1 according to the Commission are: "Industrial supply, primarily cooling water in the Lake Charles area, propagation of aquatic life for commercial and sport fishing, irrigation water for considerable acreage of rice, recreational use, including water contact sports, and carriage of municipal and industrial wastes." The anticipated future uses according to the Commission are: "Municipal water supply in the upper reaches, carriage of treated municipal and industrial wastes, and increased use for industrial supply." General criteria for water quality standards established by the Commission state: "No discharge to Zone 1 shall result in conditions in the stream which will adversely affect the public health or use of the water for municipal and industrial supplies, recreation, propagation of aquatic life and other legitimate uses." The following are specific criteria:12/

pH	Within the range of 6.0 - 8.5.
Dissolved Oxygen	Not less than 50 percent of saturation at existing water temperature.

12/ State of Louisiana, Louisiana Stream Control Commission, Water Quality Criteria and Plan for Implementation (Unpublished report, 1968) p. 37.

SETTING

Temperature	Not to be raised more than 3 degrees centigrade above normal ambient water temperature, not to exceed a maximum of 36 degrees centigrade.
Oils	There shall be no slicks of free or floating oil present in sufficient quantities to interfere with the designated uses, nor shall emulsified oils be present in sufficient quantities to interfere with the designated uses.
Toxic Materials	None present in quantities that alone or in combination will be toxic to animal or plant life. In all cases the level shall not exceed the TLM[a/] 48/10.
Foaming or Frothing Materials	None of a persistent nature.
Coliforms (MPN[b/]/100 ml)	The monthly median shall not exceed 1600/100 ml, nor shall this count exceed 5420/100 ml in more than 10 percent of the samples in any one month.
Other Materials	Limits on other substances not heretofore specified shall be in accordance with recommendations set by the Louisiana Stream Control Commission and/or by the Louisiana State Board of Health for municipal raw water sources.

The Division of Water Pollution Control of the Louisiana Wild Life and Fisheries Commission has monitored water quality in Calcasieu River for several years. Water samples used in these tests were obtained monthly at the U.S. Highway 190 Bridge crossing about 4 miles of Kinder. Data collected show that the water quality is within the ranges established by the specific criteria. The tabulation on the following page shows the results of 8 years of monitoring the water quality.

There are 25 ponds in the watershed. Twelve ponds totaling 40 acres are multi-purpose serving as sources of water for livestock and for fishing. Thirteen are devoted to commercial catfish

a/ Median Tolerance Limits

b/ Most Probable Number

Water Quality Data - Calcasieu River Below U. S. 190 Bridge[a/]

Year		pH (UNITS)	Diss. Oxygen (PPM)	Oxygen Saturation (PERCENT)	Temp. °C	Turbid-ity (UNITS)	True Color (UNITS)	Susp. Solids (PPM)	Diss. Solids (PPM)	Total Solids (PPM)	Specific Conductance (UMHOS/CM²)	Total Hardness (PPM)	Total Alkal. (PPM)	Sul-fates (PPM)	Chlorides (PPM)	Sodium (PPM)
1973	Mean	6.9	6.8	71	19	22	63	73	94	117	50	16	25	5	10	7
	Maximum	8.7 Sp[b/]	8.5 W	80 Sp	26 S	50 F	80 W	124 F	468 Sp	470 Sp	90 S	23 Sp	64 Sp	13 W	50 S	30 S
	Minimum	6.0 W	5.0 S	60 S	9 W	10	40 F	2 W	10 W	12 W	20 W	6 F	9 W	0 Sp	3 S	0 Sp
1972	Mean	7.0	7.2	76	19	25	63	26	475	501	54	18	38	10	13	9
	Maximum	7.5 Sp	8.8 W	91 S	27 F	45 W	160 F	54 W	3068 F	3070 F	120 F	47 Sp	96 Sp	15 W	38 F	24 Sp
	Minimum	6.3 W	6.3 S	62 W	5 W	10 F	5 S	2 F	36 Sp	56 F	30 Sp	6 F	8 W	6 F	4 S	0 Sp
1971	Mean	7.0	7.0	71	17	20	66	29	71	100	78	21	35	17	9	8
	Maximum	7.5 F	9.2 W	87 W	25 S	35 Sp	100 W	116 W	169 F	187 F	90 S	42 F	62 F	30 Sp	14 W	17 S
	Minimum	6.3 Sp	2.7 Sp	27 Sp	9 W	5 F	30 F	1 F	0 W	32 W	60 W	14 W	21 Sp	7 F	7 F	1 F
1970	Mean	6.6	7.8	80	18	33	49	17	92	109	165	15	23	13	10	11
	Maximum	7.3 F	11.4 W	87 S	30 S	46 F	80 F	38 F	170 S	180 S	620 F	32 W	31 S	37 S	41 Sp	35 Sp
	Minimum	6.0 W	6.2 S	65 F	4 W	30 S	30 S	2 S	38 Sp	66 S	50 Sp	11 F	9 W	6 S	4 Sp	3 Sp
1969	Mean	6.7	8.0	82	18	32	42	19	97	116	113	29	26	7	10	15
	Maximum	8.0 F	11.1 W	96 W	28 S	50 Sp	100 Sp	74 Sp	224 S	246 S	250 Sp	186 F	117 F	11 W	21 F	46 S
	Minimum	5.8 W	5.8 S	73 S	8 W	30 F	20 F	0 F	22 Sp	42 Sp	48 Sp	12 Sp	8 W	3 F	4 Sp	4 Sp
1968	Mean	6.9	7.5	76	17	30	40	24	111	135	113	15	17	9	6	9
	Maximum	7.6 S	9.8 W	86 F	27 S	32 W	70 Sp	94 W	382 S	404 S	145 S	25 F	31 F	14 F	8 F	28 F
	Minimum	6.0 W	5.6 F	64 Sp	4 W	30 Sp	10 F	0 Sp	46 W	74 W	72 W	10 Sp	6 W	6 F	3 W	1 W
1967	Mean	6.8	7.9	80	17	39	38	26	95	121	134	20	27	16	7	10
	Maximum	8.1 W	9.7 W	90 W	28 S	75 S	60 Sp	70 Sp	178 S	188 S	206 S	38 S	48 W	93 F	11 S	18 F
	Minimum	6.0 W	5.8 Sp	58 Sp	7 W	30 F	10 S	4 W	38 S	46 S	106 Sp	12 Sp	10 Sp	3 S	3 Sp	5 S
1966	Mean	6.5	7.5	77	18	35	45	6	97	103	141	19	23	7	17	10
	Maximum	7.8 S	9.1 Sp	86 S	28 S	89 W	90 W	14 S	182 F	190 F	168 S	38 Sp	31 S	13 W	115 Sp	16 Sp
	Minimum	5.8 Sp	4.9 Sp	53 Sp	9 W	30 Sp	20 W	0 W	40 S	46 S	116 Sp	13 S	12 Sp	3 S	6 F	7 W

a/ Unpublished Data. Louisiana Wild Life and Fisheries Commission. Division of Water Pollution Control

b/ Sp = Spring
S = Summer
F = Fall
W = Winter

production and comprise a total of 23 acres. About 820 acres of wetlands as defined in USDI Circular No. 39 are in the watershed.13/

Economic Data

There are three broad categories of industries in the economy of any region: (1) Basic industries such as farming, mining, and forestry which are based on natural resources; (2) processing industries such as grain elevators, petroleum refining plants, and lumber mills which depend on the basic industries; and (3) service industries such as wholesale and retail stores, communications, transportation, medicine, etc., which are based on the other two industries as well as their own members.14/

The economy of the watershed is based primarily on agriculture although there are petroleum wells in some sections. Crop production, the most important sector of agriculture, is followed by forestry and pasture production. The major farm and ranch enterprises are rice, soybeans, and cattle. Pulpwood, saw logs, and poles are the main forestry items produced; however, little of these contribute to farm income since most of the forest land is owned by commercial timber companies. Agriculture related industries include grain elevators, fertilizer mixing plants, agricultural flying services, pulpwood loading yards, sawmills, tractor and equipment dealers, and others. These industries are in the watershed and nearby towns.

In 1967, Allen Parish produced $7,903,000 worth of petroleum, natural gas, and natural gas liquid; in 1968, it produced $6,361,000 worth.15/ The 1968 value represents 882,259 barrels of crude oil, 256,343 barrels of condensate, 1,612,409 m.c.f. (million cubic feet) of casinghead gas, and 10,653,264 m.c.f. of natural gas.16/ Although

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13/ U.S. Department of the Interior, Fish and Wildlife Service, Wetlands of the United States, Circular No. 39 (Washington: U.S. Government Printing Office, 1956), pp. 20-22.

14/ Gerald A. Doeksen, Robert E. Daugherty, and Charles H. Little, "Multiplier Effects of Agriculture and Other Industries," OSU Extension Facts, Science Serving Agriculture No. 808 (Stillwater: Oklahoma State University), pp. 808-808.1.

15/ James R. Robo and Dean A. Dudley, Statistical Abstract of Louisiana, 4th ed. (New Orleans: Division of Business and Economic Research, College of Business Administration, Louisiana State University at New Orleans, 1971), p. 353.

16/ Ibid., p. 360.

total values of minerals removed are high, only a small percentage of this money constitutes salaries of employees within the watershed. Since the oilfields are small, royalties are paid to relatively few landowners.

Approximations based on the 1970 Census of Population indicate that the watershed population was 4,400, all of which were classified as rural. About 2,300 of these people lived in the town of Kinder. There were about 1,325 households in the watershed. The work force was about 1,275 persons with approximately 6 percent unemployed. The median family income was about $5,857. About 15 percent of the work force was employed in agriculture.

The number of farms is decreasing and the size is increasing. The following data from the Census of Agriculture showing farms grouped by size for Allen Parish exemplifies this.

Farm Size	1959 Number	1959 Percent	1969 Number	1969 Percent
Under 50 acres	408	53	166	32
50 to 99 acres	115	15	93	18
100 to 179 acres	77	10	74	14
180 to 259 acres	35	5	38	7
260 to 499 acres	59	8	55	11
500 and over	73	9	97	18
Total	767	100	523	100

Rice and soybeans are the two principal crops grown in the problem area. About 10,500 acres of rice and 14,300 acres of soybeans were grown in 1973. Rice yields range from 18 barrels to 32 barrels per acre and soybean yields range from 10 bushels to 34 bushels per acre depending on the severity of the wetness problem. Rotation of rice and pasture is rapidly being replaced with rice and soybeans. As of 1973, only 4,000 acres of rotational pasture and 1,200 acres of high and low management pasture remained.

About 38,850 acres of forest land exist in the watershed. About 25,650 acres of this is industrially owned and the remaining 13,200 acres is privately-owned. A portion of the private ownership is leased or managed by forest industries. Small privately owned tracts are scattered throughout the forest. Improved management, application of desirable practices, and harvesting with plans for the future have progressively improved forest stand composition to include a greater proportion of desirable species of pine and hardwoods.

Acreages of forest land are not expected to change significantly from the present. There is a papermill in DeRidder (40 miles from the watershed) and two in Elizabeth (25 miles from the watershed.) Other forest related industries are located within a 50-mile radius. The high growth rate of trees, high demand, and ease of marketability of timber products should provide incentives for the land to remain in trees. Another indication is that from 1959 to 1973, approximately 500 acres were cleared while 2,000 acres were planted in pine seedlings.

Analyses, in which 1969 Census of Agriculture data were used, indicate that there were approximately 200 farms in the watershed averaging about 200 acres in size. Crop and pasture acreage average about 190 acres per farm. An estimated 90 percent of the farms are family types and are distributed uniformly in the open-land portion.

Land values for agricultural purposes range from $300 per acre for poorly-drained land to $450 per acre for the better-drained land. These values depend on location, soil type, and degree of conservation measures applied. Forest-land values range from $200 to $300 per acre, plus stumpage value of timber on the land. Present prices for good sawtimber in the area averages $90 per thousand board feet for pine, $35 per thousand board feet for mixed hardwoods, and $6 per cord for pine pulpwood. Stocking averages about 3,000 board feet of sawtimber and 7 cords of pulpwood per acre.

Approximately 135 miles of roads exist in the watershed. About 60 miles are hard-surfaced and 75 miles are graded or graveled. Farm-to-market and travel routes are adequate except that an estimated 10 miles of roads flood after heavy rainfall. The two major railroads providing service have loading facilities at several points.

The watershed is located within the Lower Mississippi Region Comprehensive Study Area and the Southwest Louisiana River Basin Study Area. The work plan is compatible with the objectives of these studies.

Fish Resources

Fisheries within the watershed are found in Calcasieu River, 25 farm ponds, lower portions of Channels M-1, M-2, M-5, and M-7; Long Gully, Stines Creek, and Reeves Creek. Calcasieu River, the outlet for the watershed, is a perennial stream. Portions of the four project channels (M-1, M-2, M-5, and M-7), Long Gully, Stines Creek, and Reeves Creek have intermittent flow conditions. Long Gully, Stines Creek, and Reeves Creek will not be disturbed by the project.

SETTING

The part of Calcasieu River in the watershed is 18 miles in length, has an average width of 100 feet, and has 220 surface acres. The river has a highly diversified fish population with a standing crop of 100 pounds per acre.17/ About 20 percent of the population is game fish, 30 percent is commercial fish, and 50 percent is rough and forage fish species. Important game and commercial fish species are largemouth, spotted, and yellow bass; spotted, longear, and green sunfish; warmouth; flier; bluegill; black and white crappie; channel, blue, and flathead catfish; smallmouth and bigmouth buffalo; bullheads; gars; and freshwater drum. There are no known species of fish that are threatened within the project area.18/ The tabulation on the following page contains a list of fish species for Calcasieu River.

Twelve of the 25 farm ponds totaling 40 acres have been stocked with largemouth bass, bluegill, and redear. The 13 remaining ponds totaling 23 acres are devoted to the production of channel catfish with average annual production of 1,500 pounds per acre. There are no crawfish ponds in the project area.

Channels M-1, M-2, M-5, and M-7; Long Gully, Stines Creek, and Reeves Creek have intermittent flow in the lower reaches. Intermittent flow exists in a total of 17 miles with a surface area of 40 acres.

Channels with Intermittent Flow

Channel	Miles a/
M-1	6.6
M-2	3.9
M-5	1.5
M-7	2.0
Long Gully	1.0
Stines Creek	1.0
Reeves Creek	1.0
Total	17.0

a/ These miles are located on the lower ends of these channels.

17/ Unpublished data from the Louisiana Wild Life and Fisheries Commission, Hoop Net Sampling Data, April 1969, Fish Population Sampling in Calcasieu River, December 1973.

18/ R. R. Miller, "Threatened Freshwater Fishes of the United States," Transactions of the American Fisheries Society, Volume 101, No. 2. (Lawrence, Kansas: Allen Press, 1972), pp. 2-5.

Fish Species Found in Calcasieu River[a]

Game Fish

Largemouth bass
Spotted bass
Spotted sunfish
Longear sunfish
Bluegill
Green sunfish
Warmouth
Flier
Yellow bass
Black crappie
White crappie

Commerical Fish

Channel catfish
Black bullhead
Yellow bullhead
Flathead catfish
Blue catfish
Freshwater drum
Paddlefish
Longnose gar
Shortnose gar
Spotted gar
Alligator gar
Smallmouth buffalo
Bigmouth buffalo

Rough and Forage Fish

River carpsucker
Grass pickerel
Spotted sucker
American eel
Mosquitofish
Blackstriped topminnow
Pirate perch
Banded pigmy sunfish
Blackspotted topminnow
Strip mullet
Madtom
Brook silversides
Gizzard shad
Threadfin shad
Bowfin
Skipjack herring
Shovelnose sturgeon
Southern brook lamprey
Chestnut lamprey

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a/ Unpublished sampling data from the Louisiana Wild Life and Fisheries Commission.

SETTING

Fish crops in intermittent channels during periods of flow average about 15 pounds per acre. Carp, gar, and catfish are predominant in these channels; however, some game fish species are present. The following tabulation is a summary by category of fisheries data for the project area.

Fisheries Data Summary

Category	Acres	Standing Crop	Pounds
Calcasieu River	220	100 lbs./acre	22,000
Farm Ponds (Bass-Bluegill)	40	125 lbs./acre	5,000
Farm Ponds (Channel Catfish)	23	1,500 lbs./acre	34,500
Channels M-1, M-2, M-5, and M-7, Long Gully, Stines Creek, and Reeves Creek	40	15 lbs./acre	600
Total	323		62,100

Public access to the existing fisheries is poor. Calcasieu River has three road crossings in the project area. Small fishing boats can be "hand-carried" to the river at these locations. Access to Calcasieu River could be improved by public boat launching ramps. Access to privately-owned farm ponds, which provide fishing opportunities to the individual landowners and guests, is good.

Utilization of the fishery is average considering the access limitations and the lack of high quality fishing areas. Calcasieu River is used moderatley for both sport and commercial fishing. During the 1970-71 fishing season, 1,278 resident fishing licenses were sold in Allen Parish.19/ Fishing license sales are increasing statewide.

19/ State of Louisiana, Louisiana Wild Life and Fisheries Commission, 14th Biennial Report 1970-71, (New Orleans: Louisiana Wild Life and Fisheries Commission, 1972), p. 27.

Wildlife Resources

Forest land totals 38,850 acres (46 percent). An example of this type habitat is exhibited on page 23. Indigenous game species associated with this forest land are white-tailed deer, woodcock, fox and gray squirrels, and swamp and cottontail rabbits. Mallards and wood ducks feed in the seasonally flooded hardwood areas. Wood ducks nest in forested areas along the larger streams where suitable nest cavities and brood cover are available.

Open land totals 36,900 acres (44 percent). An example of this type habitat is shown on page 23. Open-land game species include the mourning dove, bobwhite quail, snipe, cottontail rabbit, and many species of migratory waterfowl including pintail, gadwall, mallard, widgeon, green-wing teal, blue-wing teal, mottled duck, and blue, snow, and white-fronted geese.

Waterfowl species primarily utilize the rice producing area of the open land. Other species listed primarily utilize the row crop and pasture areas.

Some species use more than one habitat type. Woodcock for example, feed in forest land, but frequently fly to open land to feed in fields.

Wetlands total 820 acres. Type 1 wetlands (seasonally flooded hardwoods, located in the Bibb-Mantachie soil association) comprise 755 acres and Type 5 wetlands (open lakes and ponds up to 10 feet deep) total 65 acres. Examples of these wetlands are exhibited on page 24. Wetlands are primary habitat for waterfowl and serve as escape cover for deer. Furbearers and many other species of nongame animals and birds also utilize the wetlands.

Other common mammals, birds, reptiles, and amphibians present are (1) mammals: nutria, muskrat, raccoon, opposum, striped skunk, mink, bobcat, gray fox, and coyote; (2) birds: blue jay, belted kingfisher, barred owl, cardinal, brown thrasher, Eastern bluebird, red-shouldered hawk, house sparrow, downy woodpecker, mallard, blue-winged teal, pintail, gadwall, common crow, and Louisiana heron; (3) reptiles: redeared turtle, three-toed box turtle, smooth softshell turtle, common snapping turtle, five-lined skink, ground skink, green anole, coral snake, copperhead, king snake, and western cottonmouth; (4) amphibians: spring peeper, bullfrog, squirrel tree frog, southern leopard frog, and dusky salamander.

Populations of game animals (except wild turkeys) are at or near carrying capacity of the habitat. Wild turkeys have been stocked and a breeding population currently exists in the West Bay Wildlife Management Area. The 3,200-acre portion of the management area which is within the watershed is north of Louisiana Highway 26. It is too early to determine the success of the wild turkey in this area. The tabulation on page 25 shows the current populations of game species. This data represents averages for the project area.

Forest Land Habitat

Open Land Habitat (Soybeans after Harvest)

Type 1 Wetlands (Seasonally Flooded Hardwoods)

Type 5 Wetlands (Open Lakes and Ponds)

Current Game Populations by Habitat Type

Species	Habitat Type	Acres	Number[a] Per Acre(s)	Total in Watershed
Deer	Forest Land	38,850	1/50	777
Squirrels	Forest Land	38,850	1/3	12,950
Rabbits	Forest Land and Open Land	75,750	1/3	25,250
Doves[b]	Open Land	36,900	1/3	12,300
Quail	Longleaf Pine	4,000	1/8	500
Quail[c]	Forest Land	34,850	1/50	695
Quail	Open Land	36,900	1/15	2,460
Waterfowl (Resident)	Forest Land, Open Land, and Water Areas	75,850	1/400	190
Waterfowl[b]	Forest Land, Open Land, and Water Areas	75,850	1/20	3,790
Turkeys[d]				

a/ Data developed in cooperation with Louisiana Wild Life and Fisheries Commission.
b/ Migratory
c/ Excluding the longleaf pine type
d/ Turkeys have been stocked in West Bay Wildlife Management Area and only a breeding population exists.

Utilization of the wildlife resources is high. Both small game and big game hunting are popular. During the 1970-71 hunting season in Allen Parish, 3,920 basic hunting licenses were sold. Basic hunting license sales are increasing statewide. For example, in 1960, 317,087 licenses were sold while in 1970 sales had increased to 475,868.[20/] Other uses of the wildlife resources are non-consumptive and consist mostly of outdoor photography, bird watching, and aesthetics.

Access to the existing wildlife resources is good. The West Bay Wildlife Management Area has all-weather roads for access. The majority of the private open land and forest land is accessible by all-weather roads. Some of the roads are flooded after heavy rains. Most landowners will grant permission to hunt on their property.

Recently the U.S. Fish and Wildlife Service, Division of Rare and Endangered Species, changed its classification of "rare" and "endangered" species status to include different categories. Two of these classifications[21/] apply to species[22/] that could be in this watershed and are defined as follows:

> Endangered species are those which are on the verge of extinction. Their numbers may have been greatly reduced by man's activities or they always have been rare and could easily become extinct.
>
> Status Undetermined are species which have been suggested to be endangered but not enough information is available on their numbers to determine their exact status.

The red-cockaded woodpecker is classified in the "endangered" species category. A colony exists in the forested area near Channel M-7. Other species in the "endangered" category that may be here or

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20/ Ibid.

21/ U.S. Department of the Interior, Fish and Wildlife Service, Threatened Wildlife of the United States, Resource Publication 114. (Washington: U.S. Government Printing Office, 1973), p. 203.

22/ U.S. Department of Agriculture, Soil Conservation Service, Technical Note 38, July 1973, p. 6.

may be an occasional visitor is the Southern bald eagle. The wood ibis and the osprey, which are in the "status undetermined" category, could possibly occur. There are no "threatened" plants listed for the project area from available literature.23/

Recreational Resources

A 1970 inventory conducted by the State Parks and Recreation Commission lists 24 recreational sites for Allen Parish and 23 recreational sites for Jefferson Davis Parish. According to the Bureau of Outdoor Recreation's land classes, 46 of these were recreational and 1 was natural environment. Four of these sites are in the watershed. These consist of (1) the town park in Kinder having two baseball diamonds, a picnic area, and picnic tables, (2) two groups of private camps and lodges, one by the Calcasieu River south of the Louisiana Highway 26 crossing and another south of the U.S. Highway 190 crossing, and (3) a public camping site for hunters located on Louisiana Highway 26 west of the Calcasieu River. Some bank fishing, float fishing, boating, and swimming occurs on the Calcasieu River.

There are no known major pollution problems in the watershed. The high water quality of the Calcasieu River has encouraged public recreational use. Public access and use of outdoor recreational facilities are good. About 300,000 forested acres are available in Allen Parish for hunting, fishing, and other public recreation.

Most of the 38,850 acres of forest in the watershed is available to the general public for hunting, picnicking, hiking, bird watching, and other dispersed recreation uses.

Archaeological, Historical Values, and Unique Scenic Areas

The earliest known inhabitants of this area were the Attakapas Indians. The name Attakapas means "man eater." Shortly before the white man came to Louisiana, the Attakapas were defeated by the

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23/ Unpublished Threatened Plant List for Louisiana, Soil Conservation Service, 1974.

Opelousas and other Indians of the surrounding territory. The land in the vicinity of the watershed then became the territory of the Opelousas. These Indians settled outside of the watershed boundary approximately 9 miles southwest of the present site of Kinder on the banks of the Calcasieu River. This settlement is presently known as Indian Village.24/

The first permanent white settlers began to come into this area about 1816. French and Acadians settled largely in the southern part of Allen Parish in the prairie section.25/

The construction of a railroad from Lake Charles to Alexandria was the major impetus to the establishment of the town of Kinder. The railroad was completed in 1891 and a depot was constructed that same year. The town was laid out in 1892 and by 1910 it had a population of 635 persons. Allen Parish, formerly a portion of the old Imperial Calcasieu Parish, was established in 1912.26/

In 1908, the Peavy Burns Lumber Company established a sawmill and their central business offices a few miles from Kinder. The company constructed houses at the mill site for 50 families whose household heads were employed by the mill. Shortly thereafter, a turpentine mill was constructed. These two industries represented an important stride forward for Kinder. Up to this time the principal occupation was farming. The climate, soil, and abundant water supply were factors which established rice as the staple crop. The settlers raised what they referred to as "Providence" rice. They tilled the land with ox-drawn plows, built levees, planted rice, and depended upon Providence for rain. At that time, there were no facilities for irrigation.27/

24/ Wilbur C. Holland, Leo W. Hough, and Grover E. Murray, Geology of Beauregard and Allen Parishes, Geological Bulletin No. 27, (Baton Rouge: State of Louisiana, Department of Conservation, 1952, pp. 5-6

25/ Ibid., p. 7.

26/ Kinder Comprehensive Plan, unpublished report for the town of Kinder, pp. 3-4.

27/ Ibid., p.4.

SETTING

The Curator of Anthropology and the Louisiana Historic Preservation Officer have been contacted concerning known archaeological and historical sites within the watershed. The National Register of Historical Places was also reviewed. No known archaeological or historical sites are on record within the watershed.

The Soil Conservation Service contracted with Louisiana State University to conduct a survey in order to determine the existence of any archaeological or historical sites that would be affected by installation of structural measures. This survey is complete. No archaeological or historical sites were discovered by this survey that are located within the area to be disturbed by the installation of structural measures and no further investigation was recommended.

Two National Champion Big Trees of historical value exist in the area. One is a blackgum (15 feet, 3 inches in circumference) located in Section 12, T5S, R5W near the intersection of Long Gully Creek and the Calcasieu River. The other is a water tupelo (27 feet 1 1/2 inches in circumference) located in Section 22, T6S, R5W. This tree is 450 feet from the north end of the Calcasieu River Bridge by Kinder Canal.

Soil, Water, and Plant Management Status

Soybeans became a popular crop in the early 1960's. This is reflected by data for Allen and Jefferson Davis Parishes which show that planted acres increased each year from about 38,000 in 1965 to approximately 157,000 in 1972. With this increase has been a corresponding decrease in other cropland uses. A change from rice-pasture rotation to rice-soybeans rotation is also attributable to the progressive increase in soybean acreages.

Future changes in land use are expected to be small. The following tabulation exemplifies this:

	PRESENT		FUTURE WITHOUT PROJECT	
Land Use	Acres	Present	Acres	Present
Cropland	35,700	43	36,250	43
Pastureland	1,200	1	800	1
Forest Land	38,850	46	38,550	46
Other[a]	8,250	10	8,400	10
Total	84,000	100	84,000	100

a/ Includes roads, channels, bayous, lakes, communities, farmsteads, rights-of-way, etc.

From 1959 to 1972, approximately 1.2 million acres of forest land were cleared for crop production in Louisiana. During this same period, approximately 500 acres of forest were cleared in the watershed and 2,000 acres were planted in pine seedlings. The majority of the forest lands is being managed for timber production. Stump removal in this watershed is a difficult and time-consuming process which makes clearing costly. Some minor changes such as clearing of on-farm wood lots and increases in road rights-of-way may occur, but forested acres are expected to remain relatively unchanged in the future.

Pastureland comprises 1 percent of the watershed. This is expected to decrease in the future because of the trend toward cultivated crops. The pastureland remaining after project installation will be used mainly to raise cattle for home consumption and income supplementation.

Cropland will increase slightly in the future at the expense of pastureland and farm wood lots. Use of cropland will intensify after the project is installed. Land which is presently fallow or in low producing rice-rotational pasture will be planted to soybeans.

"Other" land will increase slightly because of new residential building and possible improvement of roads and enlargement of channels. Large-scale commercial development is unlikely.

The watershed is in the Calcasieu and the Gulf Coast Soil and Water Conservation Districts. Soil and water conservation plans have been prepared for 157 operating units covering 55,193 acres (about 66 percent of the watershed). An estimated 30 percent of the needed conservation measures have been applied to cropland and pastureland. Land treatment has been applied in problem areas as well as in nonproblem areas. During the last 10 years, landowners and users have applied measures costing approximately $989,564 (see table 1A).

The Soil Conservation Service district conservationists work closely with the soil and water conservation districts in establishing priorities of work to be done. Various methods are used to promote sound conservation in the area. These methods include radio, televison, and newsletters. One district employs a conservation technician and a full-time clerk and the other a part-time clerk to assist Soil Conservation Service field office personnel with the overall conservation program.

The Louisiana Forestry Commission, in cooperation with the U.S. Forest Service through the various Federal-State cooperative forestry programs, is providing forest management assistance, forest fire prevention and suppression, distribution of planting stock, and forest pest control assistance to private landowners. There are no lands administered by the U.S. Forest Service within the watershed. An estimated 78 percent of the forest lands are adequately protected from erosion and have acceptable drainage for this use.

SETTING

About 6,000 acres of forest land outside the industrial ownership and leased lands are in a relatively unmanaged condition. Since returns from forest land are lower than from row crops, timber stands receive little management from the private landowners. When timber reaches merchantable size, the land is cut over resulting in poor stocking and low income potential.

Timber stand improvement on private forest lands is needed to improve stocking, hydrologic conditions, and wildlife habitat. Main practices needed include thinnings, improvement cuts, and regeneration. Although timber production is low in these areas, they provide valuable wildlife habitat and flood plain protection.

WATER AND RELATED LAND RESOURCE PROBLEMS

Land and Water Management

The soils in this watershed have comparatively low erosion rates and low natural fertility. The generally flat terrain, high rainfall, and clayey subsoil cause a severe wetness problem to exist in cropland and pastureland. This condition prevents many farmers from applying needed land treatment. The Acadia-Wrightsville and Crowley-Mowata soil associations are the two main areas where this occurs. (See the General Soil Map in the Physical Data portion of the WATERSHED RESOURCES-ENVIRONMENTAL SETTING section.) Although this condition exists in varying degrees in the other soil associations, it is not as significant to farming because large portions of these areas are forested.

Riceland that is too wet to be rotated with soybeans is fallow plowed to control weeds or allowed to grow volunteer vegetation for grazing. Fallow plowing of this land limits the utilization of residues for land protection during critical rainfall periods. Because of poor vegetation, rice-rotational pasture is often overgrazed. If the wetness is reduced, crop residues could be left on the soil surface during the winter. These crop residues would help reduce raindrop splash, which facilitates erosion. Much of the land being fallow plowed would be planted to soybeans and erosion would be reduced by crop cover.

Fire protection at this time is inadequate. Fire occurrence for the years 1968 through 1973 showed an average of 1.5 percent annual burn. This far exceeds the small watershed goal of .20 percent.

Year	No. of Fires	Acres Burned	Percent of Forested Watershed Burned
1968	61	781	2.0
1969	61	566	1.4
1970	50	920	2.4
1971	28	365	0.9
1972	90	684	1.8
1973	32	136	0.4

Average Annual Burn - 1.5 percent

PROBLEMS

A fire contactor program aimed at prevention of wildfires, safe debris burning methods, and proper use of fire as a silvicultural tool will be utilized during the installation period.

Floodwater Damages and Drainage Problems

The average annual rainfall is approximately 60 inches. Rainfall of at least 2.3 inches in a 48-hour period occurs on an average of three times a year, 4.6 inches once each year, 7.8 inches once in 5 years, and 9.3 inches once in 10 years. Generally, total damages caused by floods smaller than the design (3-year) flood are greater than the total annual damages resulting from larger but less frequent floods. Damaging out-of-bank flows in portions of the area occur about three times yearly.

Rice, soybeans, rice-rotational pasture, and other minor crops make up 32, 45, 11, and 1 percent, respectively, of the cropland. The other 11 percent is in fallow land. Depending on the severity of the wetness problem, rice yields range from 18 barrels to 32 barrels per acre and average about 28 barrels per acre; soybean yields range from 10 bushels to 34 bushels and average about 29 bushels per acre. The pasture yields range from 40 pounds of beef per acre on rice-rotational pasture to 200 pounds per acre on the high-management pasture. The average pasture yields are about 65 pounds per acre.

Floodwater and drainage problems are inseparable in the crop and pasture areas of the watershed. Drainage is defined as the removal of excess subsurface or surface water from high water tables or normal precipitation. Flood prevention is defined as the conveyance, control, and disposal of surface water caused by abnormally high direct precipitation or stream overflow. Because of the flatness of the watershed, the wetness of the soil, and the high annual rainfall, water problems are closely interrelated. For instance, an abnormally high rain may occur which saturates the soil. Before soil moisture conditions are reduced sufficiently to allow work, a normal rainfall occurs which again saturates the soil and prolongs the excess moisture problem.

Because they are inseparable, problems caused by flooding and inadequate drainage will be discussed together. Excess water causes delayed planting, causes replanting requiring additional tillage, and creates difficulty in harvesting as well as use of additional equipment, fuel, and labor. The quality and quantity of rice, soybeans, and pasture are adversely affected when normal planting or harvesting is delayed.

Most of the cultivated land has been in crops for many years. The normal deterioration of channels and a change in crop rotations from rice-pasture to rice-soybeans has rendered the present drainage system inadequate. The increased runoff during periods of high precipitation overtaxes existing channels.

PROBLEMS

Rice will be used to illustrate the water problems in the watershed because it is the main cash crop and most other farm enterprises are planned around its production. Research has shown that rice planted in March or April is higher yielding than rice planted in May or June.[1/] Because of the wet conditions, however the soil is often untillable during the early months; planting is delayed and yields are reduced. If the weather does permit early planting and rain later causes flooding before the rice is large enough to tolerate the high water, rice seedling population is reduced. These areas would need to be replanted. If the rice does survive and the farmer decides not to replant, the rice will be long and spindly and lodge at maturity causing losses. The farmer often keeps the existing crop because he runs the risk of having the same problem occur after he replants. Additionally, the replanted crop will probably be lower yielding because of the later planting date.

In some areas floodwaters back into the fields and cause breaks in irrigation levees. The inability to manage irrigation water also results in an inability to control weeds which greatly affects yields.

Storms which cause flooding and poor drainage at harvest time affect quality significantly enough to lower prices received. Flooding in a ricefield ready for harvest is exhibited by the upper picture on page 35. The items significantly affecting the price received for rough rice are head rice and grade.

Head rice is defined as unbroken kernels together with those broken kernels equal to or greater than three quarters the size of an unbroken kernel. The main reason for the kernels' breaking is overripeness. This often happens when a large rain occurs at the time that a field of rice is ready to harvest. Wind during the rainstorm causes the rice to lodge and lie in the water and the poor drainage causes the water and moisture to remain in the field for long periods. This wetness causes the moisture in the rice to test higher than the allowable tolerance. Therefore, harvest has to be delayed and the rice becomes overripe. Level 1 of head rice which is equal to or less than 79.9 pounds per barrel can cause a decrease in price of as much as \$0.70 per barrel. Level 5 of head rice which is equal to or greater than 110 pounds per barrel can cause an increase in price of as much as \$0.55 per barrel.

Factors significantly affecting grade are weed seeds, damage, red rice, and chalk. The grade is usually determined by the factor having the lowest rating. For example, if a lot had three factors occurring at level 1 (the best) and one factor occurring at level 3, the rice would be assigned grade 3. The average price difference between the highest operative grade (grade 3) and the lowest operative grade (grade 5) was about \$0.12 per barrel. The operative grade are those in which the majority of the rice is classed, mainly the middle 47 grades.

1/ 58th Annual Progress Report, Rice Experiment Station (Baton Rouge: Agricultural Experiment Station, Louisiana State University, 1966), p. 12.

Foreground - Flooding Problem on Pasture
Background - Rice which was Ready for Harvest
before it Lodged in the Floodwater

Flooding in a Field of Soybeans
Which have already set Pods

PROBLEMS

Excess wetness adversely affects grade factors. Rice which stays waterlogged in the field is damaged by fungus diseases. Depending on the weather, it will sometimes sprout or begin to sour and rot. Other times it will get chalky.

Levees break from flooding and cause delays in the initial irrigation thus allowing abnormal weed and red rice infestations. Poor drainage which prevents or delays cultivations and causes herbicides to be less effective allows weed infestations in soybeans. The weed seeds and red rice produced in the soybean fields multiply the control problems when these same fields are rotated with rice.

A research report entitled Effects of Production Practices on Soybean Yields, Costs and Returns, Southwest Louisiana Rice Area, published by the Department of Agricultural Economics and Agribusiness of Louisiana State University, shows how production practices varied among producers. The following tabulation is a summary of production practices considered in the study.

Item	Unit	Yield Groups Low	Medium	High
Average number of acres planted	acres	306.6	404.4	488.2
Good and above surface drainage	percent	32.7	61.0	66.0
Fall plowing	percent	64.4	66.7	70.1
Nine or more preplant land preparation operations	percent	13.9	10.6	4.1
Liming	percent	17.8	31.2	41.2
Fertilization in previous year (1970)	percent	95.0	95.0	96.9
Mixed fertilizer application in 1971	percent	97.0	98.6	100.0
Land planted to rice in 1970	percent	48.5	50.4	57.7
Average pounds of nitrogen applied per acre	pounds	7.5	8.9	11.0
Average pounds of potassium applied per acre	pounds	63.3	63.7	70.7
Average pounds of phosphorus applied per acre	pounds	59.8	62.5	69.2
Planted foundation seed	percent	3.0	2.2	4.1
Planted early maturing varieties	percent	8.0	12.1	24.7
Used seed protectant	percent	81.2	71.6	78.4
Innoculated seed	percent	100.0	97.9	100.0
Sword opener planter	percent	51.5	44.0	36.1
Double-disc opener planter	percent	19.8	25.5	33.0
Grain drill	percent	23.8	25.5	30.9
Planted broadcast	percent	28.7	30.5	30.9
Completed planting by 5/31	percent	51.5	73.8	85.6
Planted 1.0 to 1.5 inches deep	percent	39.6	46.8	55.7
Planted 2.0 and 2.5 inches deep	percent	53.5	47.5	40.2

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Item	Unit	Yield Groups Low	Medium	High
Planted on 7-inch rows	percent	16.8	21.3	23.7
Applied pre-emergence	percent	72.3	84.4	75.3
Three or more cultivations	percent	30.7	39.0	29.9
Hand hoeing	percent	27.7	22.7	23.7
Average or better weed control	percent	72.3	83.7	93.8
Applied insecticide	percent	17.8	34.0	42.3
Average or better weather conditions	percent	50.5	58.9	69.1

Several important implications from the study are as follows:

1. that low yield producers can increase average yields and returns through increased drainage, liming, and fertilization programs;

2. that low yield producers with careful variety selection based on soil type, date of planting, and date of maturity can increase yields and incomes;

3. that low yield producers can generally increase yields by planting approximately 1 bushel (row planted) or 80 pounds (broadcast) of certified, high quality seed per acre before May 31;

4. that low yield producers can increase yields and returns by a more complete weed control program (both pre-emergence, post-emergence and conventional) where weed infestation is a problem;

5. that low yield producers can increase yields and returns by a more thorough insect control program when insect infestation is evident; and

6. that low yield producers can lower the costs of production by the use of six-row equipment in the case of row planted soybeans and by broadcast planting with four-row land preparation equipment.

Although most of the soils in the watershed are low in natural fertility, they will produce high crop yields and large quantities of forage if properly drained and recommended rates of lime and fertilizers are applied. Farmers are reluctant to invest in higher inputs of production when risks of loss are high. If drainage and flooding problems such as those exhibited on page 35 were remedied, land which is fallow or in low producing pasture would be planted to soybeans or some other crop in rotation with rice. Yields would improve on a large percentage of the land presently in production.

Flooding of streets and yards in the town of Kinder occurs about twice a year. When large rains occur, the water rises and spreads because of the flat terrain. This spreading causes relatively large areas to be inundated at a shallow depth. Flooding above floor elevations of homes and businesses has not been recorded. The majority of the buildings are on pillars which causes floor elevations to be 1 to 2 feet higher than ground elevations. The pictures on page 39 exemplify this type flooding. Flood damage in Kinder is primarily inconvenience and lower quality of life. No monetary value can be assigned to these. People have to remove their shoes or wear rubber boots to get to or leave their automobiles. Children miss school because they have to wade through water to reach bus stops. Water flowing on street surfaces seeps into sewerage lines and overloads sewerage pumps. Excess water in the lines often causes manhole covers to be displaced allowing contaminated water to flow overland. When large areas are inundated, toilets fail to operate for periods up to 12 hours. The extra load causes sewerage pump life to be reduced. Debris such as leaves and twigs float on yards and have to be removed.

Flooding causes some roads to be impassable. This interrupts farming operations and the use of roads by local residents. Schoolbus routes have had to be changed during floods causing time delays and school absenteeism to rise. One driver accidentally drove his loaded bus into a ditch because the roadway was covered with water. Fortunately, no injuries or fatalities were reported. Road flooding is illustrated by the picture on page 40. Standing water causes undesirable health conditions in that it harbors mosquitoes. In instances where medical assistance would be required, flooded roads may prevent an individual from receiving timely treatment.

Average annual floodwater damages are $335,300. Of this amount, $307,000 are crop and pasture damages, $11,800 are road and bridge damages, and $16,500 are indirect damages. Crop and pasture losses because of impaired drainage amount to monetary values similar to floodwater damages.

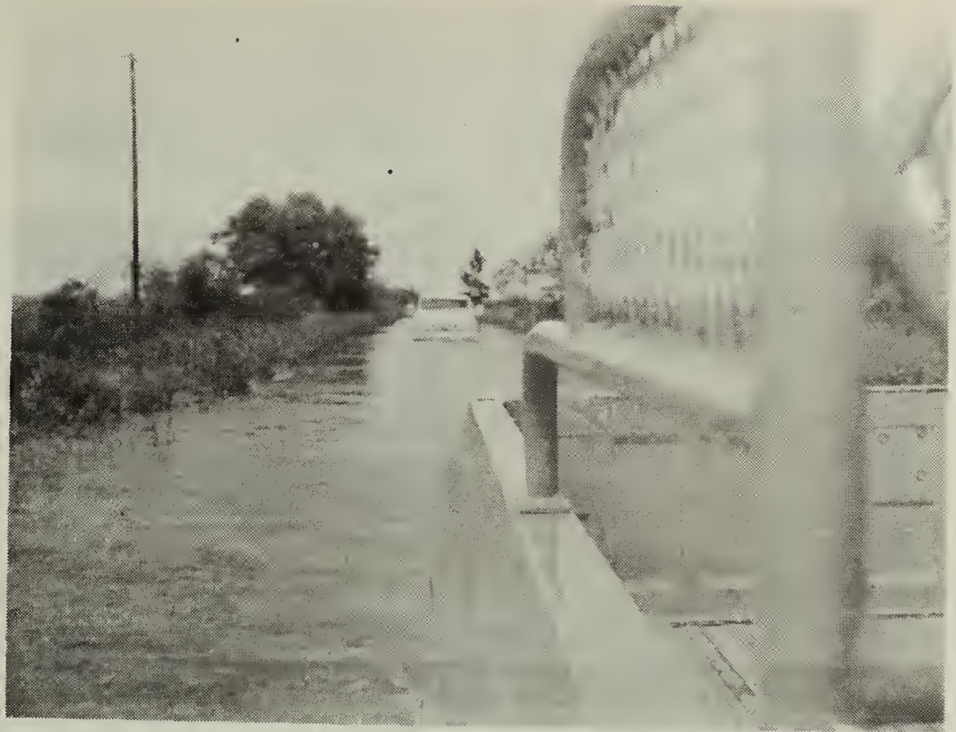
Erosion Damage

The flatness of the slopes of the soils throughout most of the watershed causes erosion damages to be low. The areas of steeper topography on each side and parallel to the Calcasieu River are forested and are basically protected from erosion.

Sheet erosion is the major type of erosion within the watershed. While other forms of erosion such as gully, streambank, roadside, etc., are present, they are relatively insignificant. Sheet erosion amounts to 81,157 tons per year or an average of 0.97 ton per acre per year. Land use and cultural practices cause a wide variation from this norm as is shown in the tabulation on page 41.

Flooding Around a Home

Flooding Around Chicken Coop



Flooding of Farm to Market Road

Flooding of Farm to Market Road

PROBLEMS

Land Use	Acres	Average Sheet Erosion (tons/year)	Average Sheet Erosion (tons/acre/year)
Rice	11,600	17,017	1.47
Rice-Rotational Pasture	4,000	4,120	1.03
Rice-Rotational Soybeans	16,000	36,955	2.31
Fallow	4,000	12,485	3.12
Unimproved Pasture	400	87	.22
Improved Pasture	800	50	.06
Forest Land	38,850	2,425	.06
Truck Crop	100	293	2.93
Other	8,250	7,725	.94
Total	84,000	81,157	0.97

A form of erosion which is very evident occurs where farm drains enter channels. Without adequate care the farm drains erode, the banks slough, and small washouts develop. This type of erosion amounts to over 400 tons per year. The amount of soil loss from this form of erosion is insignificant in comparison to sheet erosion. There are no areas which can be classed as critical sediment source areas.

The greater part of the cropland (approximately 30,700 acres out of 35,700 acres) occurs on soils of the Crowley-Mowata Association and the Acadia-Wrightsville Association. These associations have developed on the Prairie Terrace and display the low relief and flat slopes common to this formation. These are very deep soils which have a layer of topsoil approximately 16 inches thick. The soil loss due to sheet erosion on soybeans (2.31 tons per acre per year) would only amount to only 0.014 inch per year. The erosion damage in terms of lost agricultural production is not large enough to calculate a monetary value for it.

Sediment Damage

The soil material eroded by sheet erosion is very fine grained silt and clay. Settling out of this fine-grained material because of changes in water velocity is much slower than more coarse material under similar changes. This, in conjunction with the limited amount of erosion, causes the sediment to be deposited as a thin film in overflow areas. The nature of the deposition is not conducive to the blockage of the natural drainways to the channels.

Sediment damages to agricultural land are not large enough to assign monetary values to them. However, sediment in channels provides areas of higher fertility which support the growth of willow trees and other phreatophytes. This causes additional sediment deposition resulting in more maintenance. From an environmental standpoint, sediment causes water to be turbid which (1) lowers the aesthetics of the channels, (2) lowers the diversity and mass of lower food chain

organisms, and (3) lowers the quality of this water for domestic and wild animals and for fishery and recreational purposes.

Several channels, M-1, M-3, M-4, M-5, M-6, and M-7, deliver sediment to the Calcasieu River. At the present time these channels deliver an aggregate of 16,633 tons of sediment per year to the Calcasieu River, 7,176 of which are delivered to the river above the sampling station below the U.S. Highway 190 Bridge. Changes in turbidity levels and suspended solids in the Calcasieu River because of sediment from the watershed are insignificant. The large drainage area of the river (1,700 square miles) makes the changes resulting from the discharge of the watershed (131 square miles) unmeasurable. A comparison of water quality in the Calcasieu River at the northern boundary of the watershed (Louisiana Highway 26 Bridge) and near the southern boundary (U.S. Highway 190 Bridge) can be made from the graphs on pages 43 and 44.

Irrigation

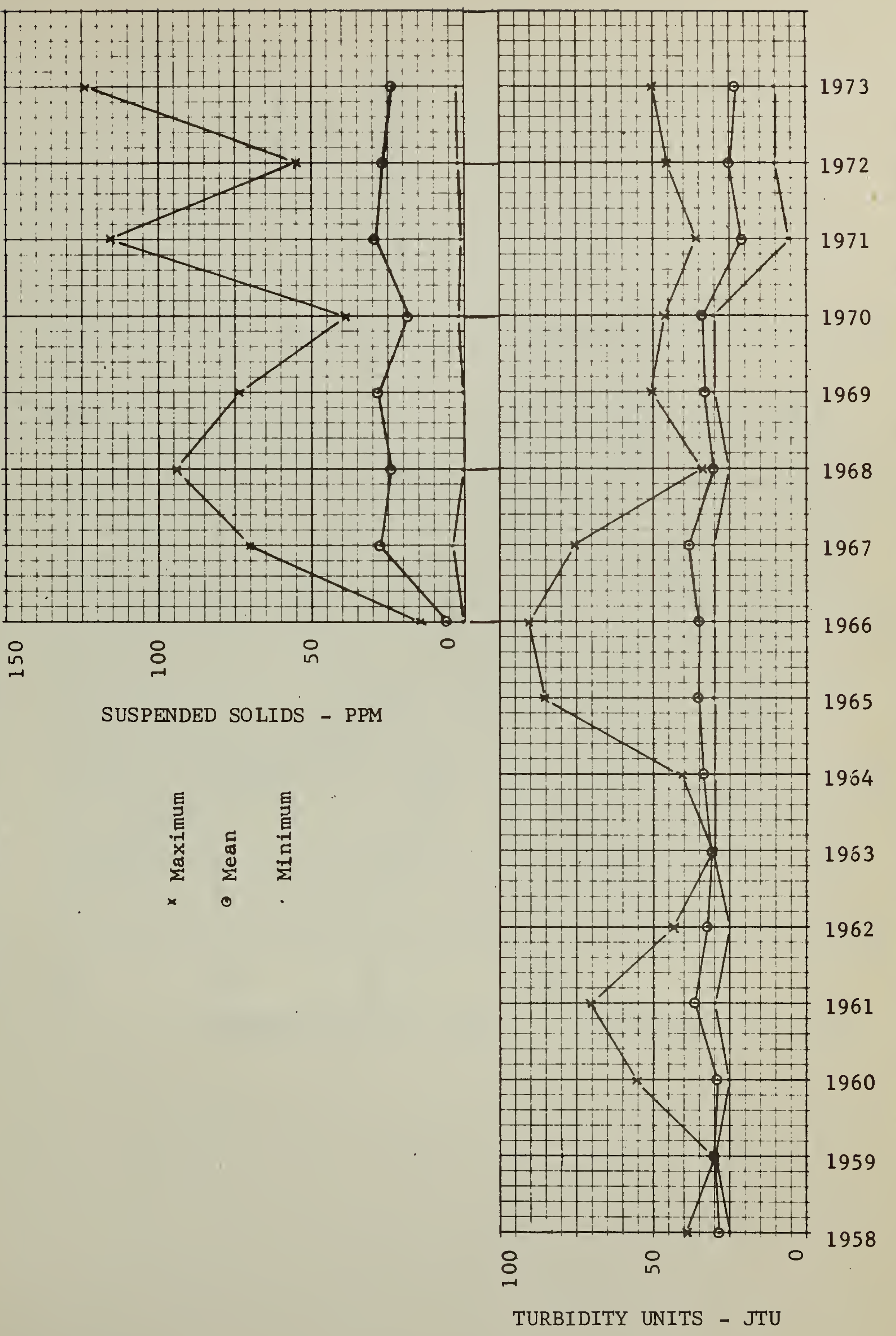
Between 1952 and 1961 pumpage of water from all areas obtaining water from the Chicot Aquifer stabilized at approximately 220 billion gallons per year. Since the aquifer appeared to be stable, this withdrawal evidently equaled the recharge to the reservoir. After 1961 pumpage increased and by 1969 reached 337.6 billion gallons per year. The increase in pumpage caused water levels to decline. In the Kinder Watershed, this decline amounts to approximately 0.5 foot per year.

Rice is the only crop in this watershed which is being irrigated regularly. In 1954, 25 to 50 percent of the rice was irrigated with ground water. At the present time, approximately 90 percent of the rice is irrigated with ground water. The remaining 10 percent is irrigated with water from Calcasieu River and Whiskey Chitto Creek. Some irrigation water is obtained from channels. Release water from fields upstream is the source of this water.

An estimated 90 percent of the total cropland is irrigated. However, only 30 percent is irrigated during any given year. The remaining 10 percent is suitable for irrigation.

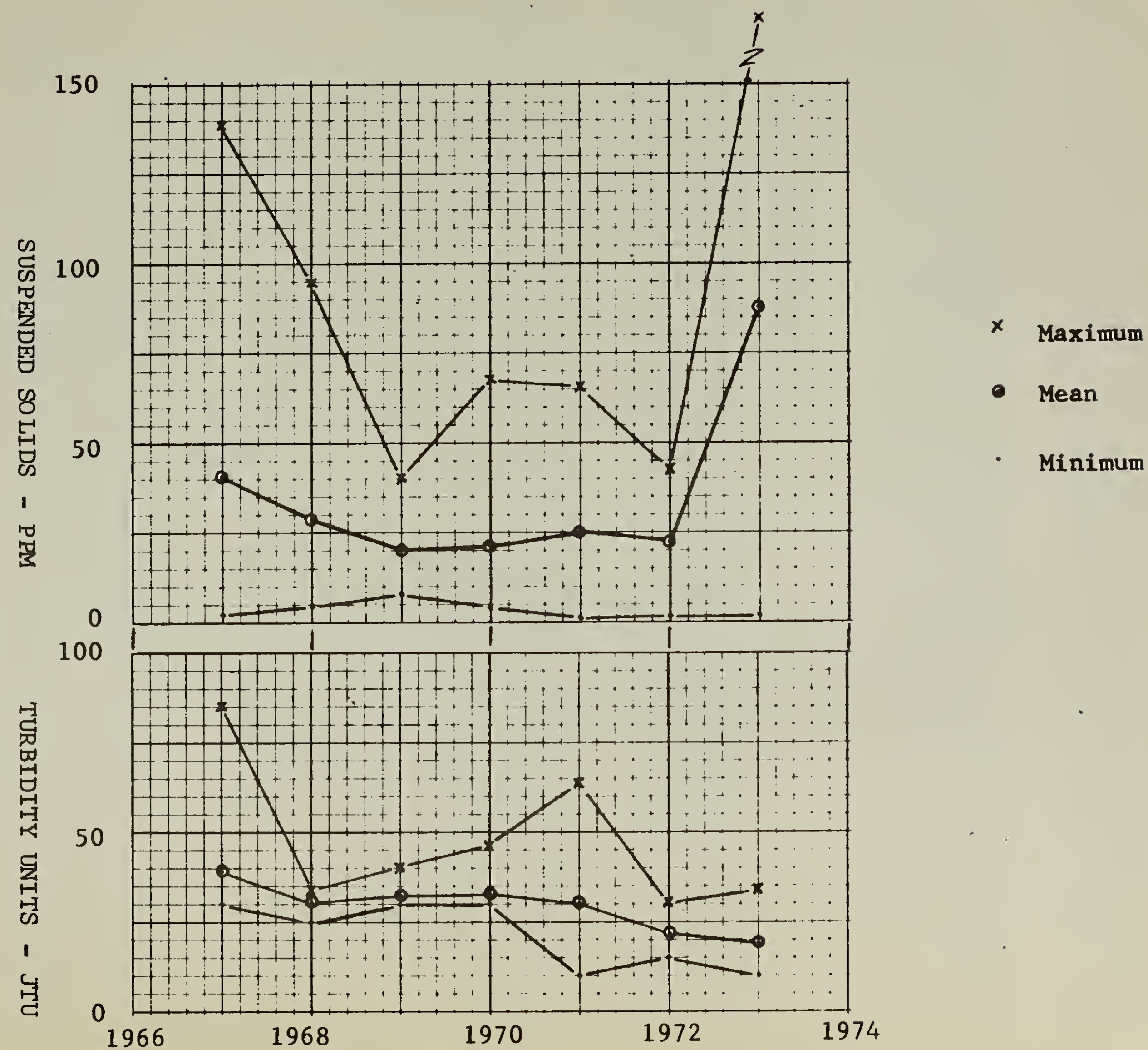
The three principal soil associations, Acadia-Wrightsville, Crowley-Mowata, and Caddo-Beauregard, are especially suitable for surface irrigation used in rice production. The soils of the Bowie-Ruston Association are not as well suited for surface irrigation because of their slope and excessive rate of water movement through the soil. These soils, comprising only 10 percent of the watershed are still predominately forested. Because of this, their potential for surface irrigation in the future is limited. The soils of the Bibb-Mantachie Association are not suitable for irrigation because they are subject to frequent damaging floods.

CALCASIEU RIVER WATER QUALITY - TURBIDITY UNITS AND SUSPENDED SOLIDS, BELOW U. S. HIGHWAY 190 BRIDGE, 1958-1973



SOURCE: Louisiana Wild Life and Fisheries Commission, Division of Water Pollution Control
Baton Rouge, Louisiana

CALCASIEU RIVER WATER QUALITY - TURBIDITY UNITS AND SUSPENDED SOLIDS, LOUISIANA HIGHWAY 26 BRIDGE, 1966 - 1973



SOURCE: Louisiana Wild Life and Fisheries Commission, Division of Water Pollution Control, Baton Rouge, Louisiana

PROBLEMS

More farmers drill wells for irrigation as time progresses. This trend is caused by economic factors and by the lack of a dependable water supply from other sources. A well adequately used to irrigate rice will normally pay for itself within a period of 5 to 10 years.

Efficiency of irrigation systems increases as farmers develop or improve their independent systems. Land forming has increased irrigation efficiency and will continue to do so as this practice is applied. Agricultural ground water requirements can be met without serious problems.

Municipal and Industrial Water

Population projections show a 15-percent increase for Allen Parish from 1970 to 1990. The only municipality within the watershed is the town of Kinder, with a population of about 2,300. The present municipal water supply appears to be adequate to at least 1990.

The three municipal water wells existing in Kinder are functional. Two of these produce from the Evangeline Aquifer and one produces from the Chicot Aquifer. The well screened in the Chicot was drilled in 1940 and is not in use at the present time because of water hardness. Well No. AL-157 (drilled in 1951) and AL-239 (drilled in 1956) produce from the Evangeline Aquifer. AL-239 is the only well that has completion data and chemical analysis of the water available. It was drilled to a total depth of 806 feet and has a total of 62 feet of screen set at different levels between 584 feet and 806 feet. The static level in 1956 was at 40 feet and the pumping level was at 136 feet. This well has a potential yield of 295 gpm[2/] or 185 gallons per day per person. The average pumpage from the Evangeline Aquifer is 200,000 gallons per day or 87 gallons per day per person.

The well producing from the Chicot has harder water (hardness as $CaCO_3$ = 32 ppm) than the wells from the Evangeline (hardness as $CaCO_3$ = 7 ppm). The sodium content of the water from the Evangeline Aquifer is higher (Na - 184 ppm) than the water from the Chicot (Na + K = 26 ppm). The chemical analysis on page 46 is of the water from Well No. AL-239.

2/ J. L. Snider, M. D. Winner, Jr., J. B. Epstein, Ground Water for Louisiana's Public Supplies (Baton Rouge: Louisiana Department of Public Works, 1962), p. 3.

Well No. AL-239

Item	Reading[a/]	Item	Reading[a/]
Silica (SiO_2)	26	Phosphate (PO_4)	5.8
Iron (Fe)[b/]	.45	Boron (B)	.63
Iron (Fe)[c/]	.57	Dissolved solids:	
Manganese (Mn)	.02	Calculated (Sum)	459
Calcium (Ca)	2.5	Residue on evaporation at 180° C	478
Magnesium (Mg)	.2	Hardness as $CaCO_3$	7
Sodium (Na)	184	Percent sodium	98
Potassium (K)	.6	Specific conductance (micromhos at 25°C)	725
Bicarbonate (HCO_3)	460	Color[d/]	150
Sulfate (SO_4)	.8	pH (Lab.)	8.3
Chloride (Cl)	13	Temperature	75
Fluoride (F)	3.6		
Nitrate (NO_3)	1.0		

a/ In parts per million except as otherwise indicated.
b/ In solution at time of analysis.
c/ Total amount of iron in sample; presumably in solution when collected.
d/ Not in parts per million.

Source: J. L. Snider, M. D. Winner, Jr., J. B. Epstein, Ground Water for Louisiana's Public Supplies (Baton Rouge: Louisiana Department of Public Works, 1962), p. 17.

Recreation

Local interest exists for developing recreational facilities in the watershed. The Calcasieu River is the only available water resource. Suitable sites for additional storage are not available because of the generally flat terrain.

The 1970 population within a 50-mile radius of the watershed, which includes the Lake Charles Metropolitan Area, is about 389,000. Projections to the year 2020 indicate the population will be 494,000, representing a 27-percent increase in a 50-year period. The topography of the southern half of a circle encompassing a 50-mile radius is flat and the northern half is gently rolling. The area is above average in the quantity of water available for fishing and water sports. Calcasieu Lake, Lake Charles, Bundicks Lake, Indian Creek Reservoir, Cocodrie Lake, and Chicot Lake are within the area of influence but on the periphery of the 50 miles relative to the watershed. The Calcasieu River and the Mermentau River, which originates about 15 miles southeast of Kinder, provide numerous miles for fishing and water-based recreation.

PROBLEMS

An estimate of recreational needs based on the present population within the 50-mile radius includes 2,000 tent camping sites, 1,300 trailer camping sites, 1,900 picnicking sites, 350 boating ramps, and 12 beaches and swimming areas of standard size.[3/] There is a need for additional facilities especially within the watershed. Significant recreation areas used by the public include three wildlife management areas on forest land totaling 223,500 acres, 6,480 acres in Chicot State Park, 1,062 acres in Sam Houston State Park, 2,868 acres in Indian Creek Recreation Area, and 31,125 acres in the Lacassine National Wildlife Refuge. The 183,000-acre Toledo Bend Lake is located northwest of the watershed and just outside the 50-mile radius. This lake provides recreational activities to many, including watershed residents.

Fish and Wildlife

The plant communities and animal populations are relatively stable. No extensive land use changes are occurring in either the forest land or the open land. Only 500 acres of forest were cleared from 1959 to 1973. In the same period, 2,000 acres were planted in pine seedlings.

One of the main problems affecting game animal populations as reported by the personnel from Louisiana Wild Life and Fisheries Commission is illegal hunting. The current demand on timber products could adversely affect nongame species such as the red-cockaded woodpecker.

Fisheries are poor in channels in the watershed. Intermittent flow conditions, small size of the channels, and poor water quality are the limiting factors. Perennial streams are nonexistent except the outlet, Calcasieu River. The following tabulation exemplifies water quality data.

Water Quality Data for Channels M-1, M-5, and Stines Creek (February 1974 and March 1974)

February 1974

	M-1	M-5	Stines Creek
Color (apparent)	1,020 units	420 units	490 units
Nitrogen, Ammonia	1.8 ppm	0.7 ppm	1.2 ppm
Nitrogen, Nitrate	0.1 ppm	0.1 ppm	0 ppm
Phosphate, Ortho	1.2 ppm	0.4 ppm	0.4 ppm
Sulfate	0 ppm	0 ppm	0 ppm
Sulfide	0.3 ppm	0.1 ppm	0.2 ppm
Suspended Solids	182 ppm	45 ppm	40 ppm

- continued -

3/ Based on State Comprehensive Outdoor Recreation Plan for 1970-1975.

Water Quality Data for Channels M-1, M-5, and Stines Creek (February 1974 and March 1974)

	M-1	M-5	Stines Creek
Turbidity	390 JTU	155 JTU	200 JTU
Temperature	50° F	55° F	50° F
pH	6.5	6.0	5.5
Oxygen	9.0 ppm	8.0 ppm	7.0 ppm
Total Hardness ($CaCO_3$)	18 ppm	12 ppm	12 ppm

March 1974

	M-1	M-5	Stines Creek
Color (apparent)	425 units	4,530 units	405 units
Nitrogen, Ammonia	.50 ppm	15.2 ppm	1.1 ppm
Nitrogen, Nitrate	.21 ppm	.57 ppm	.03 ppm
Phosphate, Ortho	.49 ppm	5.6 ppm	.23 ppm
Sulfate	5 ppm	0 ppm	0 ppm
Sulfide	.13 ppm	1.62 ppm	.10 ppm
Suspended Solids	90 ppm	1,050 ppm	40 ppm
Turbidity	145 JTU	2,855 JTU	140 JTU
Temperature	65° F	65° F	67° F
pH	6.5	5.5	5.3
Oxygen	9.0 ppm	5.0 ppm	3.0 ppm
Total Hardness ($CaCO_3$)	12 ppm	35 ppm	14 ppm

Economic and Social

The level of income necessary for surviving on a minimum diet with none of the amenities of prosperity has been determined by the Social Security Administration.[4/] An individual is considered poor if his personal income or the income of the family to which he belongs inadequately provides for his subsistence. In 1960, by this definition, 44 percent of all the families in Allen Parish were classified as poor; 65 percent of the poor families were white and 35 percent were nonwhite. In 1966, 37 percent were classified as poor. This was an improvement of approximately 9 percent since 1960. However, 87 percent of all the counties in the United States had a smaller proportion of poor families. About 0.6 percent of the families in the State of Louisiana live in Allen Parish. However, 0.8 percent of all the poor families in the

4/ James R. Robo and Dean A. Dudley, Statistical Abstract of Louisiana, 4th ed. (New Orleans: Division of Business and Economic Research, College of Business Administration, Louisiana State University at New Orleans, 1971), p. 172.

State reside in this parish. Therefore, it has a greater than proportionate share of poor families. This information and that which follows is based upon data for Allen Parish; however, this data was considered representative of the Allen and Jefferson Davis Parishes portions of the watershed.

According to the 1970 census for Allen Parish, there were 5,201 families with a median income of $5,931. Of the total families, 1,780 were urban (Oakdale) with a median income of $5,773; 2,842 were rural nonfarm with a median income of $5,857; and 579 were rural farm with a median income of $7,131. About 32 percent of the urban families had incomes less than the poverty level while 30 percent of the rural nonfarm and 25 percent of rural farm families had incomes less than the poverty level. Since the watershed population is all rural, it is estimated that 28 percent of its population is below the poverty level.

Allen Parish economic conditions based on correlates of poverty were about equal to the State average in 1970. The correlates of poverty used to determine economic conditions were (1) families having a female head with members under 18 years, (2) primary individuals 65 years of age or over, (3) households having 8 or more persons, and (4) households lacking some or all plumbing facilities.5/ However, another source6/ published in 1971 shows that the estimated buying power per household in Allen Parish for 1968 and 1969 were 28 and 29 percent, respectively, below the State average.

Although the population of Allen Parish increased by 927 persons from 1960 to 1970, it had a net out-migration of 1,800 persons. This was 8.0 percent less than the expected 1970 population. The expected 1970 population was calculated by adding births from 1960 through 1970 to the 1960 population and then subtracting deaths which occurred during that same time period. Of the total net out-migration, 59 percent were white and 41 percent were nonwhite. Many of the young adults are leaving the farm to seek employment elsewhere. From 1960 to 1970, there was a 2.6-percent decrease in rural males 20 to 39 years of age. There also was a 16.3-percent decrease in children 9 years old and under and a 25-percent increase in persons 60 years old and over. These trends indicate that young productive adults are leaving the farm thereby causing an increasing dependency on machinery. Utilization of remaining labor through greater efficiency is necessary for survival of many of the family farms.

5/ Fred M. Wrighton and Barbara H. Denton, "Population and Housing Correlates of Poverty in Louisiana, 1970," The Louisiana Economy, (Ruston: College of Business Administration, Division of Business and Economic Research, Louisiana Tech University, 1971), Vol. IV, No. 2 (May 1972), pp. 2-5.

6/ Robo, op. cit., p. 156.

PROBLEMS

Old age assistance and aid to dependent children were the two largest categories of welfare aid in Allen Parish in fiscal year 1968-69. Of the total value of welfare assistance grants made during that period, 67 percent was for old age assistance, 17 percent was for aid to dependent children, 11 percent was for disability assistance, 3 percent was for general assistance, and 2 percent was for aid to the needy blind. About 49 percent of the parish population is 18 years old or younger and 10 percent is 65 years old or older.7/ Approximately 940 children, representing about 11 percent of the population 18 years or younger, received welfare assistance.8/

Information from the 1970 census reveals that 11.6 percent of the people 25 years of age and older had never completed 1 year of school; 29 percent were high school graduates. The median was 8.3 years of school completed. There are 11 schools in the parish.

According to 1969 Census of Agriculture data, there are 523 farms in Allen Parish. This was a decrease of about 32 percent in number of farms from 1959 to 1969. The average farm size was 308 acres in 1969, as compared to 196 acres in 1959. In 1969, about 32 percent of the farms were less than 50 acres and about 50 percent were less than 100 acres. Farms in the watershed are continually decreasing in number and increasing in size.

In 1947, the season average price of rice, the main cash crop in the area, reached a high of $5.97 per hundred weight. During the 25-year period of 1947 to 1971, the season average price of rice has fluctuated from a low of $4.10 in 1949 to a high of $5.87 in 1952. In 1971, it was $5.22.9/

Under the conditions existing in 1959, a farmer using advanced technology could produce 40.50 hundred weights of rice per acre at a cost of $107.57. By 1968, the advanced technology of 1959 had become commonly accepted technology. However, to produce 42.18 hundred weights of rice per acre, it was then costing a farmer $134.79. Because the price of rice had remained relatively unchanged until 1973 and because the cost of production had increased during this period, net returns per acre had changed from $87.24 to $76.53 or decreased by $10.71. Since the farmer has little control on prices, his only alternative is to increase yields and try to reduce costs by whatever means possible.

7/ Ibid., p. 79.

8/ Ibid., p. 87.

9/ United States Department of Agriculture, Agricultural Statistics (Washington: U.S. Government Printing Office, 1972), p. 25.

PROBLEMS

The increasing costs of production inputs and the relatively static prices of agricultural products have caused net returns per acre to decrease. The following tabulation exemplifies the "cost-price squeeze" under which the farmers have been operating:

Year	Yields	Average Price	Gross Returns Per Acre	Total Cost Per Acre	Net Returns Per Acre
	cwt.	dollars			
1959	40.50[a]	4.81[c]	194.81	107.57[a]	87.24
1968	42.18[b]	5.01[d]	211.32	134.79[b]	76.53

a/ Louisiana State University, Department of Agricultural Economics, Budgets for Major Farm Enterprises in the Mississippi River Delta of Arkansas, Louisiana, and Mississippi, D.A.E. Circular No. 281 (Baton Rouge: Agricultural Experiment Station, 1961), p. 42.

b/ Arthur R. Gerlow and Willard F. Woolf, Data for Farm Planning in the Southwest Louisiana Rice Area, D.A.E. Research Report No. 403 (Baton Rouge: Department of Agricultural Economics and Agribusiness, Louisiana State University, 1969), pp. 26-27.

c/ A 5-year average of prices for the years 1957 to 1961. Prices obtained from the USDA publication Agricultural Statistics, 1972.

d/ A 5-year average of prices for the years 1966 to 1970. Prices obtained from the USDA publication Agricultural Statistics, 1972.

The increasing size of farms has also increased the average sales per farm. However, about 52 percent of the farms in 1969 in Allen Parish had sales of less than $2,500 (Class VI, Part-Time, and Part-Retirement). About 64 percent had sales less than $5,000, and about 70 percent had sales less than $10,000.

The following tabulation shows the change in number of farms by economic class over a 10-year period:

Economic Class	Sales of	1959		1969	
		number	percent	number	percent
Class I	$40,000+	23	3	60	11
Class II	20,000 to 39,999	49	6	57	11
Class III	10,000 to 19,999	57	7	40	8
Class IV	5,000 to 9,999	36	5	31	6
Class V	2,500 to 4,999	67	9	61	12
Class VI	50 to 2,499	60	8	69	13
Part-Time		405	53	158	30
Part-Retirement		70	9	47	9
Total		767	100	523	100

Source: 1959 and 1969 Census of Agriculture

PROBLEMS

Increasing cost of production inputs and relatively static prices of agricultural products until 1973 have caused decreased net returns per acre. This situation has caused many of the small operators to either leave the farm, expand their enterprises into economic size units, or seek employment elsewhere using farm returns as supplementary income. The largest change has occurred in the number of part-time and part-retirement farms. The number of Class IV, V, and VI farms has remained about the same. About 80 percent of the farm operators in these three classes have incomes at or below the poverty level if they have no outside source of income.

Approximately 10 percent of the farms use 1.5 man-years or more of hired labor. These farms are evenly distributed in the open land area of the watershed.

Other

Water for livestock and domestic use in the rural area is supplied by shallow wells, ditches, irrigation canals, and farm ponds. These sources are adequate. Ground-water recharge is mainly from the Calcasieu River.

PROJECTS OF OTHER AGENCIES

In 1971, the Louisiana Department of Public Works installed a low-level weir in Calcasieu River in the vicinity of Kinder. This structure raised the permanent water level to 28 feet mean sea level, but did not influence flood flows. The proper functioning of structural measures to be installed in this watershed will not be affected by this structure.

This same agency during the 1960's participated in the modification of certain other water courses including Bayou Serpent (Channel M-2), Bayou Alligator (Channel L-2C), and portions of Kinder Ditch (Channels M-1 and L-1F). Bayou Alligator is adequate in size and capacity. Bayou Serpent is also adequate below the lower watershed boundary. Additional channel work will be done on the upper end of Bayou Serpent and Kinder Ditch.

PROJECT FORMULATION

On Thursday, December 21, 1967, a meeting was held in Kinder to discuss and formulate the proposed Kinder Watershed application for assistance under Public Law 566. A number of persons, representing a broad cross section of the watershed community, participated. The watershed application was endorsed and the group requested the Allen Parish Police Jury, the Calcasieu Soil and Water Conservation District, and the Kinder Drainage District No. 2 sponsor the project.

The Allen Parish Police Jury, the Kinder Drainage District No. 2, and the Calcasieu Soil and Water Conservation District applied for assistance on January 15, 1968. The town of Kinder, Kinder Rotary Club, and the Allen Parish Farm Bureau endorsed the application. The Louisiana Soil and Water Conservation Committee approved the application on February 20, 1968.

Authorization to provide planning assistance under provisions of Public Law 566 was requested October 20, 1970. The authorization was granted January 25, 1971.

Interested parties and agencies were notified of this authorization for planning on February 1, 1971. Thirteen agencies acknowledged receipt of the notification and offered their assistance.

A work outline was prepared March 23, 1971, to guide the development of the watershed work plan. Representatives of the Louisiana Wild Life and Fisheries Commission, Soil Conservation Service, and local Sponsors participated in the development. A preliminary investigation map was mailed on March 24, 1971 to the regional office of the Environmental Protection Agency.

The Kinder Drainage District No. 2 issued a news release and notified all known interested parties of a public meeting to be held at the Kinder City Hall on April 26, 1971. Thirty-three people attended this meeting. All persons present were given an opportunity to express their views concerning this project and related land resource problems. All who voiced opinions supported project installation, based on prelimininary investigations. Many of the people expressed concern for the urgent need to proceed with planning and construction as soon as possible. Maps of the watershed project area were posted at the Kinder Rice Dryer and the Oberlin Soil Conservation Service office. This gave the public further opportunity to review the project area and express concerns for planning needs. These recommendations were consolidated and used as a basis for investigations and project planning.

FORMULATION

A field review of fish and wildlife resources was conducted August 5, 1971. Participating in this review were representatives of the Louisiana Wild Life and Fisheries Commission, U.S. Fish and Wildlife Service, and Soil Conservation Service. The purpose was to jointly identify valuable fish and wildlife resources and develop recommendations for their preservation. During the review, a number of suggestions were made concerning possible adverse effects of the project measures. The Soil Conservation Service requested that the U.S. Fish and Wildlife Service and Louisiana Wild Life and Fisheries Commission identify specific damages or adversely affected areas so specific project measures could be developed. The U.S. Fish and Wildlife Service made three specific recommendations by letter dated August 25, 1971. All three of these recommendations have been incorporated into the planned project.

The Kinder Watershed boundary was amended in March 1972 to include an area of 8,400 acres in Jefferson Davis Parish. The Jefferson Davis Parish Consolidated Gravity Drainage District No. 1 and the Gulf Coast Soil and Water Conservation District requested that inadequate drainage and flood problems be investigated in this area and that the plan include measures for their alleviation.

The U.S. Forest Service, U.S. Fish and Wildlife Service, and Louisiana Wild Life and Fisheries were informed of this amendment to the watershed on March 14, 1972. A map showing proposed project channels which the local Sponsors had requested to be investigated was transmitted to these agencies on April 12, 1972.

On December 5, 1972, Dan S. Martin and Associates, Inc., city planning consultants, inquired about the Kinder Watershed project. This company was preparing a Comprehensive Plan for the town of Kinder. Information concerning the watershed project and its effects on drainage in Kinder was requested. This information was transmitted to the consultants on December 15, 1972. It was supplemented at their request on January 24, 1973.

The Allen Development Association at its annual meeting February 7, 1973, unanimously passed a resolution urging completion of the plan for the Kinder Watershed. The association pointed out the immediate need for action to solve the drainage and flooding problem.

Another Public Information Meeting was held on March 25, 1973. The meeting, having been announced in the local and area newspapers, was well attended.

In order to obtain viewpoints from a different source on environmental concerns, professional services were obtained from Coastal Evnironmental, Inc. Employees of this corporation have either M.S. or Ph.D. degrees in geography (flood plain management), zoology, marine science, chemistry, geology, and geo-chemistry. Their primary expertise is environmental evaluation and environmental impact statement preparation. A team representing interests in geography, biology, geology, and zoology reviewed the work plan and environmental impact statement and made suggestions for improvement.

FORMULATION

Copies of the preliminary draft work plan and environmental impact statement were mailed to local, State, and Federal agencies and concerned groups for the informal field review. A public meeting was held on July 31, 1974 to present informal field review comments and the responses or changes resulting from these comments. Persons in the audience were given an opportunity to question and comment on the material presented.

The Louisiana Historical Preservation and Cultural Commission and the Curator of Anthropology at Louisiana State University were contacted to obtain the locations of places of historical or archaeological importance. The Forest Service assisted in the survey of forest land needs and in the watershed plan formulation.

Kinder Watershed was listed as a high priority watershed in the Southwest Louisiana River Basin Report. Purposes identified in this study were evaluated during work plan development.

Objectives

The cropland and pastureland are farmed intensively. The landowners and operators, through their watershed application, interest displayed at meetings, and input into the planning effort have indicated a desire to improve the economic condition of the watershed by maximum management of resources. They requested a project be formulated that would allow the development of all possible soil and water resources presently or potentially available.

Watershed residents are concerned about problems discussed under the WATERSHED PROBLEMS section. The Sponsoring Local Organization and the Service agreed to pursue the development of a plan for the following objectives:

1. Provide improved farming conditions to increase farm family incomes and improve living conditions.

2. Reduce erosion on cropland to the minimum consistent with maintenance of long-term soil fertility.

3. Reduce flooding and improve drainage to the extent needed to allow retention of the area for profitable agriculture in the future.

4. Install project measures in a manner which will minimize damage to fish and wildlife resources.

Environmental Considerations

Effects of the structural measures on fish and wildlife habitat were considered. The channel work will not encourage the clearing of forest

land or drainage of wildlife wetlands. To discourage clearing, channels were designed in such a way that forest land is provided a lower degree of protection than open land. The design procedure is explained in the Hydraulic and Hydrologic Investigations section. The effects of three different levels of protection on the environment were considered.

Design features were included to minimize adverse impacts on fish and wildlife habitat. Some of these features are: (1) eliminating of excavation in forest land habitat at all points where flow characteristics can be sufficiently improved by any other methods, (2) limiting excavation required in forest land to the side of the channel with the poorest quality habitat, (3) limiting excavation (in channels where high summer temperatures are a factor) to the side with the poorest bank cover, (4) terminating of excavation on channels in advance of their confluence with Calcasieu River, (5) vegetating disturbed areas with plants beneficial to game and nongame species, and (6) installing of structures for water control (weirs) to minimize damages to the fisheries in intermittent and ephemeral flow channels.

The lower end of Channel M-2 passes through a wetland area valuable as wildlife habitat. This channel was designed in a manner so that the amount and duration of flooding on the wetland as a result of direct precipitation will not be affected.

The side on which habitat will be preserved was considered in planning and will be determined at the time of construction by the Soil Conservation Service in consultation with the Louisiana Wild Life and Fisheries Commission and the U.S. Fish and Wildlife Service.

Erosion and sediment in channels were important considerations, and several measures were incorporated into the plan to reduce adverse effects. Short sections of channels, where needed, will be made deeper for sediment interception at the junctions of principal laterals with the main channels. Recessed inlets will be utilized at some of these junctions. Vegetation on berms, spoil, and channel side slopes will be reestablished as fast as possible. Structures for water control (weirs, figure 2 and pipe drops, figure 3) will be installed. The structures for water control (weirs) will trap some sediment and create 11 miles of ponded water in project channels. The structures for water control (pipe drops) will reduce soil erosion at specific points.

Other design features and construction methods included to reduce erosion and sedimentation from the channels are: (1) Channel designs insure soil stability by limiting velocities and side slopes to levels which are commensurate with the materials obtained from soil borings, and (2) Channel design and layout give special consideration to terminating construction at points where flow enters undisturbed vegetated sections which act as filtering agents.

Channel work usually causes increases in peak flow rates and peak stages downstream. These increases diminish as the distance from the

channel work lengthens. In order to evaluate downstream effects, stage increases induced by the project were studied. This study indicated that peak stages on the Calcasieu River will be increased by an amount so small that they will be unmeasurable. Peak stage increases at the downstream ends of the project channels will range from 0.01 foot to 0.3 foot. No measurable damages will result from these stage increases.

The merits of higher and lower levels of protection were studied. Providing a 5-year level of protection is economically feasible. However, the 3-year level offers sufficient protection for the crops grown in the area. The additional loss of existing wildlife habitat in providing the 5-year level would be small, but it would include part of the territory of the red-cockaded woodpecker colony. The 1.5-year level would not reduce damages to an acceptable level.

Alternatives

Land Treatment Only.- The major land treatment practices and measures which could be installed are conservation cropping system, crop residue management, land smoothing, ditching, pasture and hayland management, pasture and hayland planting, wildlife habitat management, and wildlife upland habitat management. Approximately 5,600 acres of land not dependent on improvement of drainage outlets could be adequately treated with the preceding "going" and "accelerated" conservation land treatment measures.

This alternative would reduce erosion to about the same level as with the planned project because rice-pasture rotation would not be converted to rice-soybean rotation. The installation cost of the measures necessary to accomplish this would amount to $316,800. Although some desirable environmental effects such as sediment reduction could be obtained with this alternative, monetary losses from reduced crop production, road flooding, and undesirable living conditions would remain unchanged.

Alternative crops and cropping systems were investigated that would be tolerant of the excess soil moisture condition. This alternative was studied to determine if other cropping systems and land uses could be developed that would not require structural measures to reduce inadequate drainage and flooding.

Using Land for Purposes More Tolerant to Poor Drainage Conditions - Although wet conditions at certain times hinder production of rice, it is the most water tolerant crop known which could be grown in the area. It also produces the highest economic returns. Certain pasture grasses, although their production is lowered by excessive wetness, are more tolerant of excess water than soybeans. However, it is uneconomical, in many instances, to establish permanent pastures in rice-pasture

rotation since this rotation is on a 2 to 3 year cycle. Consequently, pastures substituted for soybean would consist mainly of the low producing rice-rotational pastures, consisting mostly of volunteer grasses which existed before soybeans were introduced.

Another crop which could be introduced in rotation with rice is crawfish. The production of this crustacean fits in well with rice culture. Rice levees constructed to hold irrigation water also serve as embankments which can turn rice fields into crawfish ponds. Plant stubble and chaff left after the rice harvest serve as food for the crawfish. Irrigation systems used for rice production serve as a source of water for the ponds.

No commercial crawfish are grown in Allen Parish. In other rice areas where crawfish are grown, several drawbacks have been experienced. Fields on which insecticides have been used for control of rice insects have failed to produce crawfish.[1/] Crawfish culture has not advanced to the point where consistent yields can be obtained each year of production. Some years yields go as high as 800 to 1,000 pounds per acre, and then for some unexplainable reason, production during the next season will drop to as low as 200 pounds per acre. Research in crawfish production was initiated in 1964 at Louisiana State University. Until research progresses to the point where methods are developed to consistently produce high yields, the use of crawfish as a rotatable with rice will remain relatively low.

Another factor which reduces the desirability of crawfish production is harvesting. Soybean production requires the same production machinery as rice while crawfish production is much more labor intensive. Crawfish harvest usually begins in January or February which makes it cold, wet work for the first 2 or 3 months. Unless a farmer's operation is small enough to allow him to do all the work or is located in an area where commercial fishermen reside, he will usually experience difficulty in finding labor for harvest. If crawfish production were introduced on a large scale in the watershed, this problem would be greatly magnified.

The crawfish industry is steadily growing in southern Louisiana, but it is still relatively small and unorganized when compared to rice, soybeans, and cattle. No large central marketing facilities have been developed. Several relatively small dealers or buyers, located about 70 miles from the watershed, are the main distributors for the localized markets.

1/ Carl H. Thomas, "A Preliminary Report on the Agricultural Production of the Red-Swamp Crawfish (Procambarus olarki) (Girard) in Louisiana Rice Fields, "Proceedings of the Seventeenth Annual Conference Southeastern Association of Game and Fish Commissioners, (Columbia: Southeastern Association of Game and Fish Commissioners, 1963), p. 184.

Leveed Floodways, Pumps, and Land Treatment - This alternative would include leveed floodways to prevent headwater flooding and pumps to remove excess rainfall from the protected areas. Channels would be required inside the leveed areas to deliver water to the pumps. Additional land required for installation of this system would total about 1,850 acres. Of this total, about 1,500 acres would be committed to levees, berms, and channels. This would result in a loss of 900 acres of agricultural land, 400 acres of forest land, and 200 acres of wooded channel banks. Additional land committed to floodways would total about 350 acres. This would require about 90 acres of forest land, 140 acres of wooded channel banks, and 120 acres of agricultural land. Pumps would increase the noise level, cause pollution from fuel spillage, and could cause excessive erosion and turbidity at discharge points. Shortages of fuels or electric power for pump motors could cause flooding. Reductions in flooding and improvements from this approach would be about the same as those for the planned project except for that additional land committed to project works. The estimated total installation cost of this alternative is $9,500,000. The estimated average annual operation and maintenance cost is $500,000.

The going and accelerated land treatment program would include conservation measures to adequately treat 19,650 acres of land and partially treat an additional 17,000 acres. This would cost $935,100. The conservation measures needed to treat this area would include, but not be limited to, conservation cropping systems, crop residue management, land smoothing, drainage field ditches, pasture and hayland management, forest management, pasture and hayland planting, wildlife wetland habitat management, and wildlife upland habitat management. These measures would reduce erosion, improve water quality, improve the tilth of the soil, and reduce wetness.

Floodwater Retarding Structures and Land Treatment - The flat terrain upstream from the problem areas provides no site for floodwater retarding dams. The only portion of this alternative that could be applied is land treatment. Its effectiveness would be similar to those under LAND TREATMENT ONLY.

Channel Work and Land Treatment - Various sizes and lengths of channels were studied to determine effects of the 1.5-year, 3-year, or 5-year level of protection. The effects of each of these levels of protection were evaluated for without-project and with-project conditions. The same three levels were used for each evaluation unit because the intensity of land use is about the same throughout the project area. The evaluation units correspond to the drainage areas of the channel groups identified in the Physical Resources section of the ENVIRONMENTAL SETTING. The evaluation units are delineated and labeled on the Project Map, Figure 4. The effects of the 1.5-year and 5-year levels were unacceptable alternatives and are further explained in this section. The selected 3-year level on which the project is based is explained in the EFFECTS OF WORKS OF IMPROVEMENT section.

The loss in wooded channel bank acreage to channel and berm would decrease wildlife habitat for certain species. The acres of spoil disturbed in the wooded channel banks and forest land would return to tree cover through natural plant succession and some tree plantings. Out of the 769 acres required for channels, 81 acres would require excavation.

Larger Channels. Providing a 5-year level of protection by channel work would require 75 miles of channel with 1,520,800 cubic yards of excavation. The total installation cost would be $2,207,000. The annual cost, including operation and maintenance, would be $185,100. The damage reduction would be 83 percent.

The land treatment program would include the installation of the going and accelerated necessary conservation measures to adequately treat 19,650 acres and install conservation measures on an additional 17,000 acres. The cost is estimated to be $935,100. The measures to be installed include the same features discussed under Floodproofing and Land Treatment.

Land committed to channel, berm, and spoil areas would change in the following manner:

1. Land within channels would increase from 249 to 368 acres.

2. Land used for berms would increase from 25 to 221 acres.

3. Land used for spoil would increase from 106 to 325 acres.

Land used for channels and berms will increase because of channel enlargement and leaving wider berms to serve as maintenance access. Land occupied by spoil will increase because existing and project created spoil will not be spread for channels in most cases.

Land used for channels, berms, and spoil within the three categories - open land, wooded channel bank, and forests - would change in the following manner:

1. Open land acres occupied would increase from 98 to 267 acres.

2. Wooded channel bank acres occupied would increase from 169 to 381 acres.

3. Forest acres occupied would increase from 114 to 266 acres.

Construction for a 5-year level of protection would encroach on the normal territory of the red-cockaded woodpeckers in the watershed. The loss in wooded channel bank acreage to channel and berm would decrease wildlife habitat for certain species. The acres of spoil disturbed in the wooded channel banks and forest land would return to tree cover through natural plant succession and some tree plantings. Out of the 914 acres required for channel work, 114 acres would require clearing only and 800 acres would require excavation.

Reasons for Selecting Works of Improvement

The following tabulations furnish data to compare the effects of three different levels of channel work on land use after project construction.

Level of Protection	Land Taken Up By Channels: Channel	Berm	Spoil	Total
	----------acres----------			
Existing	249	25	106	381
1.5-year	310	186	273	769
3.0-year	339	204	298	841
5.0-year	368	221	325	914

Level of Protection	Land Use Taken Up By Channels: Open Land	Wooded Channel Banks	Forest Land	Total
	----------acres----------			
Existing	98	169	114	381
1.5-year	225	320	224	769
3.0-year	248	356	237	841
5.0-year	267	381	266	914

Sediment and turbidity produced during construction by the three levels of protection would not be significantly different. Even though the cross-sectional area changes with a corresponding level of protection provided, the results are a small change in exposed channel perimeter. For example, at one design point, the cross-section necessary to provide the three levels of protection studied would result in wetted perimeters of 20.4, 22.4, and 23.7 feet.

The 3-year level of protection requires 74 miles of channel work, 2 miles more than the 1.5-year level of protection and 1 mile less than the 5-year level of protection. It requires about 1,289,900 cubic yards of excavation, 313,400 (32 percent) more than the 1.5-year level of protection and 230,900 (15 percent) less than the 5-year level of protection. The clearing of trees within channels for the three levels of protection is essentially the same.

Wildlife habitat changes and effects on animal populations for the three levels of protection studied and preproject and postproject standing fish crops are shown in the tabulation on the following page.

The estimated reduction in flood damages for the 1.5-, 3-, and 5-year levels of protection is 47, 73, and 83 percent, respectively.

After due analysis and consideration of alternatives, a system of structural measures as shown on the Project Map, Figure 4, was selected for project formulation. The 3-year level of protection was selected from the alternatives studied as a basis for project formulation. This plan provided the best combination of structural and land treatment measures needed to obtain the balance between environmental and economic factors necessary to achieve the project objectives. Fish habitat, aesthetics, health, and water quality will be improved by the project. Wildlife habitat will be affected as illustrated in the tabulation on the following page. The land treatment measures included in the plan are those necessary to achieve project objectives in reducing the soil loss on cropland.

HABITAT ACRES AND POPULATIONS OF WILDLIFE SPECIES AND EFFECTS FOR THE THREE LEVELS OF PROTECTION

Species	Animal Acre Ratio	Pre-Project		Changes by Alternatives: 1.5-Yr. Level of Protection		3.0-Yr. Level of Protection		5.0-Yr. Level of Protection	
		Acres	Total Animals	Acres[1]	Animals[1]	Acres[1]	Animals[1]	Acres[1]	Animals[1]
Dove	1:3	36,900	12,300	+291	+97	+317	+105	+335	+112
Quail	1:15	75,750	3,655	+291	+19	+317	+ 21	+335	+ 22
Squirrel	1:3	38,850	12,950	-146	-49	-168	- 56	-188	- 63
Deer	1:50	38,850	777	-146	- 3	-118	- 3	-188	- 4
Rabbit	1:3	75,750	25,250	- 57	-19	- 90	- 30	-115	- 38
Waterfowl (Migratory)	1:20	75,850	3,790	-146	- 7	-168	- 8	-188	- 9

1/ Indicated change as a result of project.

ESTIMATED STANDING CROPS OF FISHES

Name	Pre-Project		Post-Project	
	Pounds Per Acre	Total Pounds	Pounds Per Acre	Total Pounds
Calcasieu River	100	22,000	100	22,000
Farm Ponds (Bass-Bluegill)	125	5,000	125	5,000
Farm Ponds (Channel Catfish)	1,500	34,500	1,500	34,500
Intermittent Channels	15	600	15	600
Channels (Water behind Structures for Water Control)	0	0	15	540
		62,100		62,640

WORKS OF IMPROVEMENT TO BE INSTALLED

Land Treatment Measures

Land users will install land treatment measures in accordance with soil and water conservation plans developed in cooperation with the Calcasieu and the Gulf Coast Soil and Water Conservation Districts. The following will be accomplished in regard to the development of plans:

1. Thirty-one new conservation agreements will be signed by landowners who will become soil and water conservation district cooperators.

2. Thirty-three soil and water conservation plans will be developed with landowners who are now or will become soil and water conservation district cooperators.

3. Forty-eight conservation farm plans now in use will be updated.

These plans will be based on the proper use of soils within their capabilities and limitations. The capabilities and limitations of soils in specific locations will be determined by preparation and use of soil surveys.

Detailed soil surveys will be made on 83,100 acres of land in the watershed. Such surveys will be made by the Soil Conservation Service as part of the technical assistance provided to soil and water conservation districts. Soil scientists will make systematic borings and note the differences in texture, structure, color, and thickness of each distinct layer in the soils. The steepness of the slope will be measured, and an estimate of the amount of erosion which has taken place and the rate water will move through the soil will be made. On-the-spot chemical tests will provide an indication of the alkalinity or acidity of the soil. Once the soil type has been determined, it will be delineated on aerial photographs. When the field work is complete, the soil capability class (see page 5) will be determined for each soil. From this a determination will be made of the land treatment practices needed for the desired land use in order for the land to have adequate conservation treatment.

Land treatment measures necessary to adequately treat 19,650 acres consisting of 16,600 acres of cropland, 400 acres of pastureland, 2,500 acres of forest land, and 150 acres of other land will be installed. Adequately treated land is land used within its capabilities and on which the proper conservation practices have been applied to compensate for its limitations. Providing necessary flood protection, drainage, and maintaining proper ground cover are the most important practices to consider in planning adequate treatment in this watershed. Such practices are

needed to remove surface water at a rate that will permit healthy plant growth and minimize erosion. In addition to adequately treating 19,650 acres, conservation plans will have been prepared and partial land treatment installed on 10,600 acres of cropland and about 400 acres of pastureland. The remaining 8,900 acres of cropland are presently adequately treated.

Present on-farm drainage systems fail to function at full capacity because of inadequate outlets. Improved drainage outlets provided through structural measures will allow application of land treatment measures.

Some of the major soil and water conservation practices to be installed and their functions are:

Land Treatment Measures	Function
Conservation Cropping System	Growing crops in a sequence that will provide adequate cover to protect the soil against erosion from heavy rainfall and produce high crop yields. Cropping system sequences vary according to needs of each field for protective soil cover. Cover and green manure crops together with cultural and management measures are included as needed for soil protection and improvement.
Crop Residue Management	Using plant residues on or near the soil surface of cultivated fields to provide cover during periods when the erosion hazard is critical. These residues reduce the impact of the raindrops when they strike the surface, thus reducing soil erosion and runoff. They also speed up water intake into the soil.
Drainage Mains and Laterals	Constructing open drainage ditches to designed size and grade to remove excess surface and subsurface water to improve the plant growing environment.
Land Smoothing	Removing irregularities on the land surface to provide a more uniform surface for irrigation water application, to improve surface drainage, to obtain uniform

-continued-

IMPROVEMENTS

Land Treatment Measure	Function
	planting depths, to provide for more uniform cultivation, and improve equipment operation efficiency.
Pasture and Hayland Management	Using fertilization, weed control and grazing practices to maintain a good, thick plant cover on the soil surface and produce high forage and livestock yields and control erosion.
Pasture and Hayland Planting	Establishing or reestablishing grasses and legumes for the production of animal products and pasture to control erosion. After pastures are established, pasture and hayland management practices are used to maintain good plant cover.
Structures for Water Control (pipe drops)	Using structures where the force of flowing water is sufficient to cause gully erosion. These structures provide means for lowering the water from a higher elevation to a lower elevation in a short distance, as may be required where a lateral ditch joins a main ditch several feet deeper, without causing erosion damage and the resulting sediment.
Wildlife Wetland Habitat Management	Managing wildlife wetland habitat to provide food and cover for wildlife.
Wildlife Upland Habitat Management	Managing wildlife upland habitat to provide food and cover for wildlife.

Conservation measures to be planned and applied on cropland include conservation cropping systems, crop residue management, drainage mains and laterals, land smoothing, and structures for water control (pipe drops, figure 3). Larger areas will be served by similar pipe drops installed as part of the structural measures. The treatment of pastureland will include pasture and hayland planting and management and other practices needed to provide adequate treatment.

IMPROVEMENT

About 150 acres of "other" land will receive critical area treatment. This includes seeding of channel side slopes, berms, and spoil of on-farm mains and laterals.

The forest land will continue to receive fire protection under the Cooperative Forest Fire Control Program. The forest land treatment program includes reduction of wildfires through a contactor program. This program will inform the public of the hazards of uncontrolled debris burning. An accelerated technical assistance program will identify the need and create treatment plans and management plans for 6,000 acres of forest land outside of industrial ownership. Management plans will be directed toward resource management for forest products, wildlife habitat, watershed protection, and environmental enhancement.

Wildlife wetland and upland habitat management consist of retaining and managing 1,250 acres of forest land for wildlife habitat. Technical assistance through the soil and water conservation district program will be furnished to private landowners in establishing plants for wildlife food and cover. The reduction in forest fires will result in 2,500 acres of forest land being adequately treated. Public fishing access to privately-owned farm ponds will be encouraged.

Land treatment measures will be installed during a 5-year period. Installation and maintenance of needed land treatment measures will continue after project installation.

Structural Measures

Structural measures in this plan are designed primarily to reduce flood damage and improve farm drainage. During installation full consideration will be given to the prevention of damages to fish and wildlife resources.

Structural measures consist of channel work which includes (1) excavation, (2) clearing, (3) structures for water control (weirs), and (4) structures for water control (pipe drops). The basis for selection of designs is discussed in detail under the Investigations and Analyses section.

About 101 miles of existing channels were identified for study and then classified for type of channel and flow condition. Detailed surveys and analyses revealed that project-type work was necessary on 63 miles of these and no work was needed on the remainder. Of this 63 miles, 8 miles will be cleared and 55 miles will be enlarged. Most of the channels eliminated after study were in forested areas or have other environmental qualities from a habitat standpoint that outweigh beneficial effects of improving flow characteristics. Additionally, 10 miles of new channels will also be excavated. These 10 miles have no defined channel at present. The tabulation on page 70 exhibits types and lengths of channel work and the areas occupied before and after project installation.

AREA OCCUPIED BY CHANNEL WORK

Channel Number	Excavation Length (miles)	Excavation Before Right-of-Way (acres)	Excavation After Right-of-Way (acres)	Clear Only Length (miles)	Clear Only Before Right-of-Way (acres)	Clear Only After Right-of-Way (acres)
M-1	8.96	71.2	143.2	1.23	14.3	18.7
L-1A	2.29	5.8	26.4	0	0	0
L-1B	2.33	7.0	20.0	0	0	0
L-1C	.95	2.1	7.8	0	0	0
L-1D	3.14	15.7	38.1	0	0	0
L-1D-1	.34	2.3	3.3	.19	1.6	2.3
L-1D-2	.38	.6	3.0	0	0	0
L-1E	1.34	3.6	12.7	0	0	0
L-1F	1.61	11.3	22.1	0	0	0
L-1F-1	.31	.9	2.7	0	0	0
L-1G	1.12	4.2	10.7	0	0	0
M-2	4.38	35.8	59.7	3.22	34.3	39.0
L-2B	1.22	7.2	11.2	.55	2.9	6.5
L-2C	2.21	12.3	20.0	0	0	0
L-2D a/	1.76	6.1	8.5	1.55	9.4	11.3
L-2D-1 a/	.27	3.5	5.4	0	0	0
L-2E a/	.64	8.4	13.1	0	0	0
L-2E-1 a/	.66	6.2	8.2	0	0	0
M-3	.91	2.3	6.4	0	0	0
M-4	.36	.9	2.7	0	0	0
M-5	8.45	18.9	93.5	.66	5.9	10.0
L-5A	5.39	21.2	68.5	.58	3.5	12.1
L-5A-1 a/	2.20	7.6	17.3	0	0	0
L-5A-2 a/	1.57	1.0	12.4	0	0	0
L-5A-3 a/	.72	2.2	5.7	0	0	0
L-5B	4.36	30.5	49.6	0	0	0
L-5B-1 a/	.89	2.7	7.0	0	0	0
M-6	2.61	11.2	29.0	0	0	0
L-6B	.72	0	6.6	0	0	0
M-7	2.13	5.1	20.9	0	0	0
L-7A	.57	.5	4.2	0	0	0
Total	64.79	308.3	739.9	7.98	71.9	99.9

a/ Estimated

Generally, land rights will be obtained by flowage easements with access provided to the Sponsors for construction, operation, and maintenance. The grantor will retain full ownership and control of his land.

Construction permits will probably be required by the U.S. Corps of Engineers (Engineering Regulation No. 1165-2-302). These permits will be obtained by the Sponsors prior to construction of the associated structural measures.

Of the total 73 miles of channels to receive work, about 63 miles (86 percent) have ephemeral flow and about 10 miles (14 percent) have intermittent flow. None of the work is on channels with perennial flow.

The type of work and length of sections of channels with intermittent flow to be worked are as follows:

Channel	Type of Work	Miles
M-1	Clear only	1.3a/
	Excavate	4.8b/
M-2	Excavate	2.3c/
	Clear only	1.6d/
Total		10.0

a/ This section of channel is 0.5 mile from the mouth of the channel.
b/ This section of channel is 1.5 miles from the mouth of the channel.
c/ This section is the lower 2.3 miles of this channel.
d/ This section is 2.3 miles from the mouth of the channel.

Of the 73 miles of channel work, 63 miles are manmade or previously modified channels and 10 miles are nonexisting or practically no defined channels.

Excavation will be done from only one side of the channels. Consideration will be given to leaving undisturbed the side providing the most shade during the summer months. These construction procedures are illustrated by the drawings on pages 73 and 74.

The 20 miles of channels in forest land and the 29 miles of channels having wooded banks adjacent to cropland are environmentally and aesthetically important. Efforts will be made to leave as many trees as requirements for construction and operation and maintenance will allow. Trees to be left inside the channel rights-of-way will be chosen on the basis of their size, form, color, leaf texture, bark, and flowering or fruiting characteristics.

Spoil from the channels will be stacked and smoothed in forest areas and spread, if desired by the farmer, in open areas. Openings will be left in the spoil which will allow natural drainage. Short recesses for sediment interception will be installed where needed at the junctions of principal laterals with the main channels.

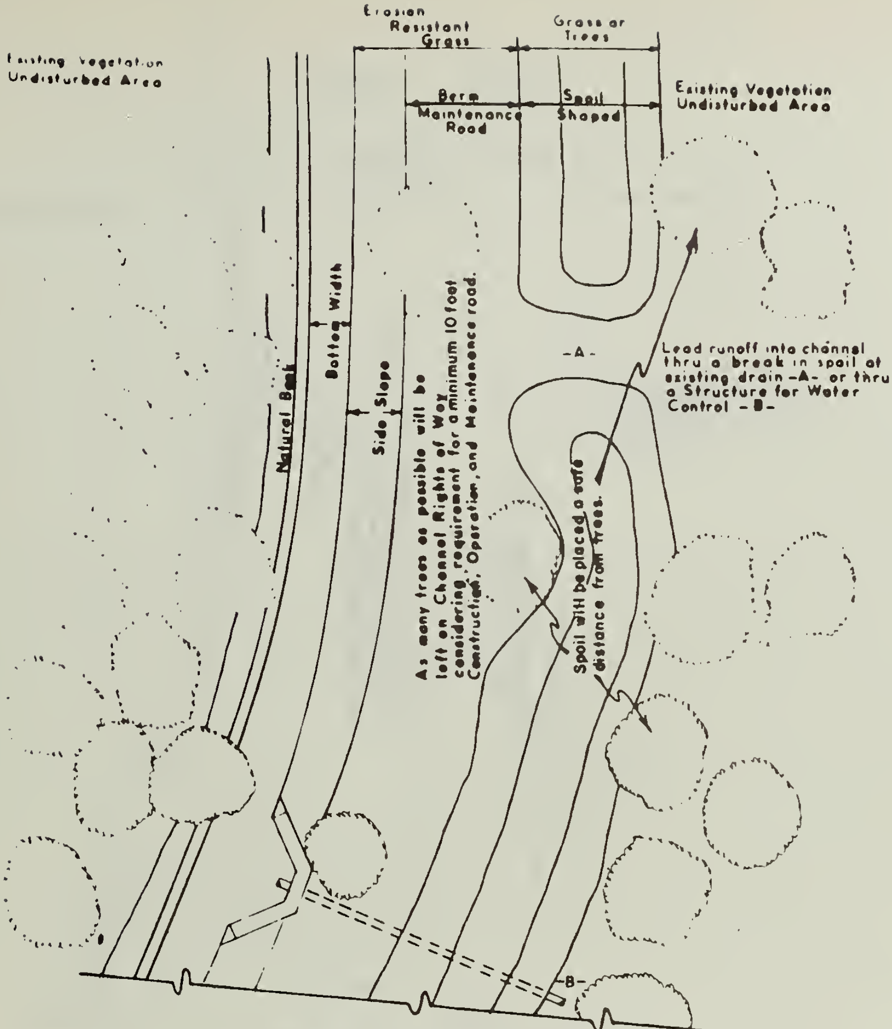
As the channel work is being performed, berms will be maintained and spoil will be placed in a manner to allow maintenance equipment access to the channel. Where necessary, culverts will be placed in laterals entering channels so that continuity of access can be maintained. Where applicable, structures for water control (weirs and pipe drops) will be constructed in a manner that will allow maintenance equipment to cross over the channel. Figure 1 of appendix E shows a typical profile and cross section of a channel.

Construction of channels will be terminated before entering the Calcasieu River. These undisturbed areas will act as a filter for sediment.

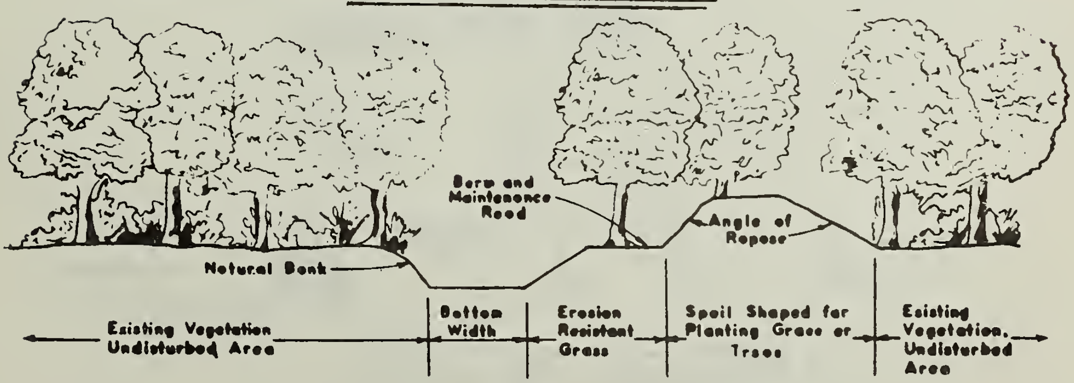
Channel M-2 was designed so as to preserve a Type 1 wetland area near the outlet. The channel will carry the runoff from the wetland and the open land upstream. The forested nature of the wetland and an absence of internal drainage cause the runoff from the wetland to be considerable less than the runoff from an equal area of open land. Because of these factors, flooding from direct precipitation on the wetland will not be affected. However, the channel work will reduce the overbank flooding on low intensity storms.

Channels M-1, L-1F, and L-1F1 were designed to provide a 3-year level of protection from overbank flooding in Kinder. Although urban protection is not a formal project objective, project channels which serve as outlets for town storm drainage systems will be made adequate to accommodate these systems. The town of Kinder has made plans to enlarge its storm sewer system to eliminate flooding from the 3-year frequency storm.

Six structures for water control (weirs, figure 2) will be installed at strategic points in channels to (1) minimize possible damages to fish and wildlife habitat, (2) reduce downstream sediment following construction, (3) reduce growth of vegetation on the channel bottom during the dry season, (4) help preserve existing water supplies necessary to maintain agricultural production, and (5) maintain aesthetics of the landscape. These structures will be installed prior to any work being performed on the upstream end of the involved channels and create approximately 11 miles (36 surface acres) of water. Their approximate locations are listed on the following page.



TYPICAL PLAN VIEW

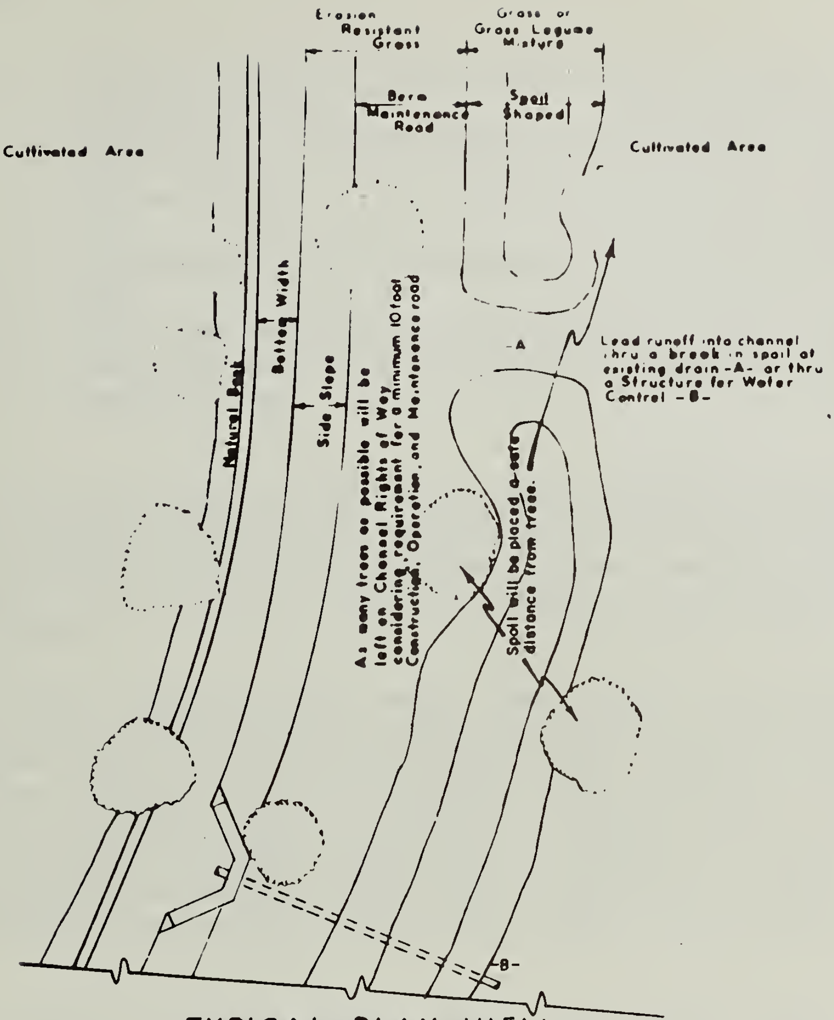


TYPICAL CROSS SECTION

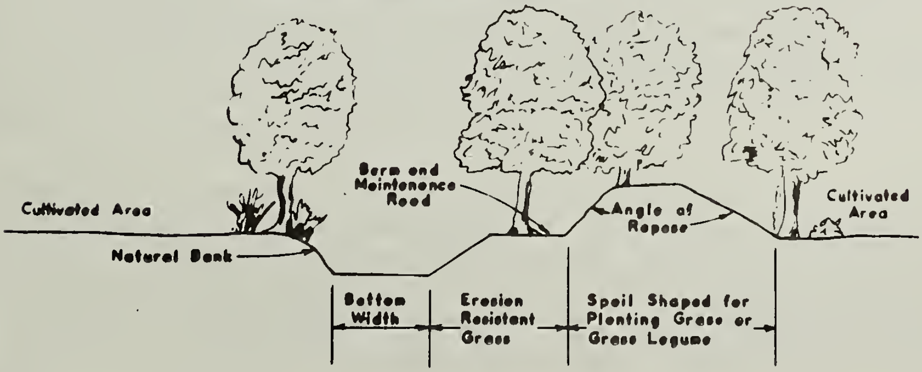
KINDER WATERSHED

ALLEN AND JEFFERSON DAVIS PARISHES, LA.

TYPICAL PLAN VIEW AND CROSS SECTION OF
CHANNELS THROUGH FOREST LAND



TYPICAL PLAN VIEW



TYPICAL CROSS SECTION

KINDER WATERSHED

ALLEN AND JEFFERSON DAVIS PARISHES, LA.

TYPICAL PLAN VIEW AND CROSS SECTION OF CHANNELS WHERE WOODY VEGETATION EXISTS ADJACENT TO CULTIVATED AREA

IMPROVEMENT

1. In the vicinity of State Highway 383 crossing on Channel M-1 near the outlet.
2. Approximately 2 miles from the outlet end of Channel M-1.
3. Approximately 6 miles from the outlet end of Channel M-1.
4. Approximately 0.8 mile above the parish line on Channel M-2.
5. About 3 miles from the outlet end of Channel M-5.
6. Approximately 1 mile from the outlet end of lateral Channel L-5A.

Structures for water control (pipe drops, figure 3) will be installed to prevent erosion and thus protect the channel from excessive sedimentation, reduce maintenance cost, and insure proper functioning of the channels. They are considered appurtenant measures to channel work.

All channel slopes will be seeded immediately after construction. Berms will be seeded immediately after construction traffic ends. Spoil on open land will be spread in some cases. Spoil in forest land will be stacked, shaped, and seeded. Depending upon soil type and season of the year, species such as the following can be used: Common bermudagrass, Pensacola bahiagrass, lespedezas, Browntop millet, ryegrass, and fescue. When annual plants are used in the initial seedings, perennial plants will be overseeded at the proper season.

Two methods for reestablishing trees on the spoil areas in forest land will be used. On 40 acres a grassy ground cover with interspersed hardwood seedlings will be established. On the remaining area (43 acres), grassy ground cover will be established and natural plant succession allowed to occur. Reestablishing of trees on these areas will experience a time lag of about 3 years.

Seedlings of species such as water oak, willow oak, sawtooth oak, and pecan will be used depending on soil types and availability. The spacing of the hardwood seedlings along the spoil and the existing trees that will be left along the edges of the channels will provide "full stocking" of the entire right-of-way. See Typical Plan View and Cross Section of Channels through Forest Land (page 73) for location of trees.

Alterations, modifications, or reconstruction of some existing facilities will be necessary to insure proper functioning of planned structural measures. These include, but are not limited to, replacing or changing 1 bridge and 7 culverts on State and Federal highways, 17 bridges and 31 culverts on parish and private roads, pipelines at 14 locations, and utility lines and fences at about 215 locations.

All bridge and culvert changes will be coordinated with responsible agencies at the construction design stage. This will insure compliance with their standards and specifications. Structural measure installations are expected to be completed in a 3-year period.

The disposal of all clearing wastes and construction debris will be accomplished by burying, burning, or removal from the construction site. All burning will be conducted in accordance with the Louisiana Air Control Commission regulations and other applicable laws governing such operations. Noise levels will be monitored by the Soil Conservation Service and standards set by the Occupational Safety and Health Act will be followed.

There are no properties listed in the National Register of Historic Places that will be affected by the installation of structural measures. Should any archaeological or historical sites be discovered during the installation of structural measures, construction will be stopped. The Secretary of Interior (National Park Service), the Curator of Anthropology, and the Historical Preservation Officer will be notified and will be given an opportunity to evaluate and make recommendations for salvage or mitigation before construction continues. Also, the Advisory Council on Historic Preservation will be afforded an opportunity to comment in accordance with the "Procedure for the Protection of Historic and Cultural Properties."

The State Historic Preservation Officer's letter dated January 9, 1975 states that his department does not know of any sites on the National Register of Historic Places or being actively nominated to the National Register which would be effected by this proposed project.

Two National Champion Big Trees exist in the watershed. These have been located and the Louisiana Forestry Commission will work with landowners in preserving them.

EXPLANATION OF INSTALLATION COSTS

The total installation cost is estimated to be $2,866,500 of which $1,177,200 will be borne by Public Law 566 funds and $1,689,300 by other funds (see table 1). Included in the total project cost is $944,100 for land treatment measures and $1,922,400 for structural measures.

Land Treatment Measures

Installation costs for needed land treatment measures are to be borne by individual landowners and operators. The cost of installing these measures is estimated to be $784,400. The installation of land treatment will insure the timely realization of project benefits and will provide for proper treatment of the land. This plan provides for installation of these measures within a 5-year period.

The fire prevention contactor program will cost $38,400. Of this amount $32,400 will be furnished by the Forest Service through PL-566 funds and $6,000 will be furnished by the Louisiana Forestry Commission.

Technical assistance to continue and accelerate the going program of installing land treatment measures is estimated to be $121,300 during the 5-year installation period. Of this amount, $80,700 will be provided by Public Law 566 for acceleration of the going program. The remaining $40,600 will be furnished by other funds from the going programs. The total $40,600 consists of $37,600 provided through the Soil and Water Conservation District Program and $3,000 provided through the Cooperative Forest Management Program and the Cooperative Fire Control Program.

Structural Measures

The cost of channel work including excavation, clearing, appurtenant structures for water control (weirs and pipe drops), and vegetative plantings is shown as a single line item in tables 1 and 2A. Structures for water control (weirs and pipe drops) and vegetative plantings will protect the channel from excessive erosion, reduce sediment, protect the adjacent land, and facilitate maintenance. These measures are considered appurtenances to the channel work.

The total cost of the channel work including excavation, clearing structures for water control (weirs and pipe drops), and the

vegetative planting is $1,708,100 of which $1,050,400 is for construction, $73,600 is for engineering services, and $584,100 is for land rights.

The land rights cost consists of $141,200 for the value of land, surveys, and legal fees; $39,500 for modification or replacement of 1 State and Federal bridge; $121,100 for 17 parish and private bridges; $47,200 for 7 State and Federal culverts; $50,000 for 31 parish and private culverts; $185,100 for alterations, modifications, or reconstruction of existing miscellaneous facilities such as pipelines and irrigation facilities.

The estimated cost of installing the appurtenant structures for water control (pipe drops) is $134,380 for construction and $9,410 for engineering services.

The estimated cost of structures for water control (weirs) is $155,400 of which $145,200 is for construction and $10,200 is for engineering services which will be required for the installation of these structures.

The estimated cost of establishing the vegetative planting is $88,800 for establishment and $6,200 for technical services.

No additional land rights are considered necessary for the installation of structures for water control (weirs and pipe drops) and vegetative plantings. They will be installed in the channel rights-of-way.

The channel work together with the structures for water control (weirs and pipe drops) and vegetative cover are all multiple-purpose measures serving both flood prevention and drainage. The costs of the channel work were allocated between these two purposes in accordance with standard procedures. This results in 50 percent of the cost being allocated to flood prevention and 50 percent to drainage.

The cost of all engineering services includes the direct costs of work to be done by engineers and technicians in relation to structural measures. The work consists of surveys, investigations, designs, and preparation of plans and specifications including vegetative requirements. The cost of these services will be paid by Public Law 566 funds.

No relocation payments are considered to be required at this time. If they are subsequently required, they will be funded in accordance with paragraph 2 of the Watershed Work Plan Agreement.

The Service and the Sponsoring Local Organization will bear the cost of project administration that each incurs. These costs (estimated to be $214,300) are the administrative costs associated with the installation of structural measures. The Sponsors will

bear costs for administration of contracts (10,500) and for such inspection ($1,100) they deem necessary to protect their interest. The Service will bear the costs of inspections ($105,200) that are necessary to protect the interest of the Federal Government and will prepare certificates of completion. It will also bear the cost of government representatives and other project administration services it incurs ($97,500). A project agreement between the Service and the affected Sponsors will be executed before any work is begun.

The costs of measures were estimated using current prices of work of comparable size and complexity and adjusted to local conditions. This was further modified by adding a contingency of about 20 percent to provide a reasonable margin to cover unexpected costs.

A Schedule of Obligations for the 5-year installation period, including both land treatment and structural measures, is as follows:

KINDER WATERSHED
SCHEDULE OF OBLIGATIONS
(Dollars)1/

Year	Measures	PL-566 Funds	Other Funds	Total Funds
1st.	Construction	334,875	111,625	446,500
	Engineering Services	48,800	-	48,800
	Land Rights	-	329,700	329,700
	Project Administration	57,700	2,300	60,000
	Land Treatment	-	164,500	164,500
	Soil Surveys	13,800	800	14,600
	Technical Assistance	17,200	7,700	24,900
2nd	Construction	187,200	62,400	249,600
	Engineering Services	24,800	-	24,800
	Land Rights	-	254,400	254,400
	Project Administration	53,500	4,100	57,600
	Land Treatment	-	158,000	158,000
	Soil Surveys	10,000	700	10,700
	Technical Assistance	15,900	7,700	23,600
3rd	Construction	265,725	88,575	354,300
	Engineering Services	-	-	-
	Land Rights	-	-	-
	Project Administration	56,300	3,000	59,300
	Land Treatment	-	157,200	157,200
	Soil Survey	10,000	700	10,700
	Technical Assistance	16,000	7,700	23,700
4th	Construction	-	-	-
	Engineering Services	-	-	-
	Land Rights	-	-	-
	Project Administration	35,200	2,200	37,400
	Land Treatment	-	155,900	155,900
	Soil Surveys	-	-	-
	Technical Assistance	15,400	7,700	23,100
5th	Construction	-	-	-
	Engineering Services	-	-	-
	Land Rights	-	-	-
	Project Administration	-	-	-
	Land Treatment	-	154,700	154,700
	Soil Survey	-	-	-
	Technical Assistance	14,800	7,700	22,500
	GRAND TOTAL	1,177,200	1,689,300	2,866,500

1/ Price base 1974.

EFFECTS OF WORKS OF IMPROVEMENT

Flood Prevention and Drainage

Peak stages in channels downstream from the channel work will be increased because velocities will be increased. However, these increases are so minute that they are nearly unrecognizable. The following tabulation lists computed increases immediately downstream from each main channel:

Channel No.	Station	Stage Increase Feet 3-Yr.	10-Yr.	100-Yr.
M-1	25+00	0.3	0.2	0.2
M-2	10+00	.1	.05	.05
M-3	36+00	.01	.01	.01
M-4	35+00	.01	.01	.01
M-5	72+00	.2	.2	.1
M-6	50+00	.1	.1	.1
M-7	143+50	.1	.1	.1

Attenuation by the Calcasieu River at the mouth of channels will make the small increases so minute that they will be unmeasurable. Changes in discharges and stages caused by channel work decrease as the distances downstream increase.

The project will provide protection to agricultural land from a storm which is expected to occur on an average of once every three years. This does not mean that the runoff from this storm will be contained wholly within banks. Rather, it means that the runoff from the storm will be back within banks 24 hours after the storm ceases. Runoff from storms of greater magnitude will inundate land for periods longer than 24 hours. However, the period of inundation will be shorter than it is under present conditions, thereby reducing the probability of crop loss.

Channels M-1, L-1F, and L-1F1, located on the outskirts of the town of Kinder, are designed to pass the peak flow from a 3-year storm for the urban area. Enlargement of these outlet channels by the project and improvement of the storm sewer system by the town will reduce nuisance-type damages and improve living conditions. Average frequency of flooding will be reduced from about twice a year to about once in three years. Runoff from storms of greater magnitude will still inundate portions of the town, but for shorter periods of time. Flood hazard duration to roads and streets will be reduced with vehicle traffic back to normal much sooner. Maintenance will also be reduced.

EFFECTS

The installation of the combined program of land treatment and structural measures will directly benefit about 32,900 acres of cropland and pastureland. The remaining 4,000 acres of cropland and pastureland in the watershed will not directly benefit from project-type action. Although benefits were not calculated on these acres, they will benefit from the accelerated installation of land treatment measures and by rotational systems made possible by the flood prevention and drainage provided the other lands by the project.

The project will accelerate the establishment of conservation practices and increase the effectiveness of those already applied. These practices will protect the agriculture resources of the area and improve the environment. Landowners and operators will construct and maintain adequate on-farm and group drainage facilities with the assurance that the desired benefits will accrue.

An estimated 165 farmers will directly benefit from the installation of project measures and land treatment. The remaining 35 farmers will benefit from accelerated land treatment. These measures will also provide benefits for the 430 farm family members. Farm employees will also benefit. The other 3,970 watershed residents, as well as residents of surrounding areas, will benefit from the increased volume of business generated by the higher incomes and the decreased flooding.

Land use in the watershed for without project and with project conditions is expected to be as follows:

	FUTURE WITHOUT PROJECT		FUTURE WITH PROJECT	
Land Use	Acres	Percent	Acres	Percent
Cropland	36,250	43	36,100	43
Pastureland	800	1	800	1
Forest Land	38,550	46	38,427	46
Other[a/]	8,400	10	8,673	10
Total	84,000	100	84,000	100

a/ Includes roads, channels, bayous, lakes, communities, farmsteads, rights-of-way, etc.

EFFECTS

The tabulation on page 82 reflects permanent land use changes from one category to another. About 841 acres of land will be disturbed during the installation of channel work. Of this amount, 381 acres are presently occupied by channel rights-of-way. Under "Future Without Project Conditions," there will be 98 acres in open land, 114 acres in forest land, and 169 acres in wooded channel banks being taken up by channel rights-of-way (channels, berms, and spoil). "Future With Project Conditions" will require that 248 acres in open land, 237 acres in forest land, and 356 acres in wooded channel banks be taken up by channel rights-of-way. Project installation will cause an additional 150 acres of open land, 123 acres of forest land, and 187 acres of wooded channel banks to be occupied by channel rights-of-way. These changes indicate that there will be an overall increase in the "other land" category because of additional rights-of-way requirements in open land and forest land. However, since wooded channel banks are already in the "other land" category, there will be no changes shown because of this increase. Timber losses on forest land and crop and pasture losses on open land required for project installation will amount to gross annual values of $2,100 and $21,500, respectively.

With the project installed, rice, soybean, rice-rotational pasture, other minor crops, and fallow land will make up 32 percent, 63 percent, 11 percent, 1 percent, and 1 percent, respectively, of the cropland. Cropland now in low producing rice-rotational pastures and lying fallow during years rice is not produced on it, will be planted to soybeans once the project is installed. Average yields of rice, soybeans, and pasture are expected to increase by about 7 percent, 9 percent, and 90 percent, respectively. The reason for such a large increase in beef yields is that most of the low producing pasture will go into soybean production; consequently, beef yields with the project installed are represented mostly by the higher yielding pastures. The average prices received for rice, soybeans, and beef are expected to increase by 1 percent, 1 percent, and 2 percent, respectively.

Floodwater and drainage effects are discussed together because the problems are inseparable. Channels which remove floodwater also remove drainage water.

The reduced flooding and improved drainage will decrease soil wetness and improve field conditions. This will allow better timing of cultural practices and more time to perform needed operations. The higher yields and profits will encourage the application of land treatment practices at a faster rate. Farmers will be better able to leave crop residues on the land during winter months, reduce fall plowing, and rotate crops. This will conserve soil fertility, reduce erosion, improve wildlife habitat and help control weeds.

Planting will be accomplished at more opportune dates. The more level, better-drained fields will allow utilization of larger equipment. This will save labor and reduce costs.

In general, the project will improve economic conditions under which the farmers have been operating. They will be able to:

1. Plant earlier thus getting better plan populations,

2. Control weeds and grasses better,

3. Harvest at more opportune times, and

4. Produce higher quality and higher yielding crops.

Incomes will increase and incentives will exist for farmers to apply soil and water conservation practices which otherwise would be beyond their financial means. Yields will be increased because of more uniform plant populations which will have to compete less with weeds.

Pasture will also be affected. Grasses will grow faster providing more forage. Desirable species will replace unpalatable water tolerant weeds. Stocking rates will increase. The land will produce nearer to its potential because of these factors and a reduction in the number of grazing days lost.

Reduction in time necessary for land preparation, reduction in frequency of replanting, more effective weed control measures, and more efficient harvesting will reduce annual cost of production about $98,800. Longer periods of time will be available during critical production periods of maximum utilization of equipment and other factors of production. Reductions in flooding and increased timeliness of operations will also increase the quality of products. Average increase in prices received by farmers will be about one percent or $47,000.

Watershed needs and objectives will receive primary consideration in the forest management and land treatment program. Improved conditions produced under proper management and protection will allow better movement of air and water in the soil. The management plans for the remainder of the forest land will help improve the stands and increase productivity and economic returns from the land. Forest lands will be managed utilizing the multi-use concept.

Pollution from fertilizer will not increase significantly because of the project. Estimates of fertilizer use in the future show an increase of about 15 percent or 750 tons annually. This amount would be less if research presently being conducted proves

successful. This research deals with the time release of nutrients such as inorganic nitrogen which do not remain in the soil for long periods of time. Under continuous crops, soil fertility will decline without further use of fertilizers. Fertilizers now account for approximately one-third of the production of our total food supply.1/

Phosphates enter the water supply from agricultural runoff, water treatment, and biological wastes and residues. Industrial effluents, chemical processing, and the use of detergents and surfactants also contribute significantly. A certain amount of phosphate is essential to organisms in natural waters and is often the limiting nutrient for growth. Too much phosphate can produce eutrophication or overfertilization of receiving waters, especially if large amounts of nitrates are present.2/ Leaching of phosphorous from soils is insignificant. Most of the loss of these nutrients from agricultural lands to streams and lakes is through erosion. The concentration of phosphorous in aqueous environments is normally low, about .02 ppm, because most phosphates are insoluble in water.3/

Under normal conditions, the amount of nitrate in solution at a given time is determined by metabolic processes in the body of water; that is, by the production and decomposition of organic matter. "Hart et al., report indicates that among United States waters supporting a good fish life, ordinarily 5 percent have less than 0.2 ppm of nitrates; 50 percent have less than 0.9 ppm; and 95 percent have less than 4.2 ppm."4/

The best control methods for preventing fertilizer nutrients from entering water supplies are to apply only the amount needed at the proper time and to use management practices that will reduce erosion to a minimum. The project will create conditions which will encourage the use of such practices.

1/ U.S. Department of Agriculture, Soil Conservation Service, "Water Pollution from Agriculture," Missouri's All Employees Training Conference- Framework for the Future (Unpublished compilation of speeches and training conference, 1972), pp. 42-51.

2/ Water Analysis Handbook (Ames, Iowa: Hach Chemical Co., 1973).

3/ Richard H. Wagner, Environment and Man (New York: W. W. Norton and Co., 1971), p. 22.

4/ Jack E. McKee and Harold W. Wolf, Water Quality Criteria, Publication No. 3-A (Sacramento: State Water Quality Control Board, 1963), p. 225.

This project will have no effects on the oil and gas wells or any other industrial facilities or services within the project site.

The estimated reduction in damages for the 3-year level of protection is 73 percent. Annual crop and pasture damages will be reduced from $307,000 to $82,000. Annual damage to roads amounts to $11,800, and with the project will be reduced to $3,100. Indirect damages will be reduced from $16,500 to $4,400. No monetary values were calculated for the reduction of nuisance-type damages and the increased quality of life benefits because these are intangible effects. Better drainage will reduce annual losses on agricultural land by $225,000. Flood prevention and better drainage will allow intensification of agricultural operations resulting in $50,200 annual net income.

Erosion and Sediment

Erosion and the resulting sedimentation and turbidity will decrease with the installation of the planned project measures. Sheet erosion over the entire watershed will be reduced from .97 tons per acre per year to .85 tons per acre per year, a reduction of 12.5 percent. Sheet erosion of the cropland amounts to 1.98 tons per acre per year. This will be reduced by 15 percent or to 1.68 tons per acre per year. These reductions will be accomplished by land treatment measures.

Total sediment delivered to the Calcasieu River and Bayou Serpent during the project installation period will be reduced by 33,600 tons. The following tabulation exhibits the reductions by years of the project installation period:

Sediment Reduction

Year	Tons
1	1,900
2	4,400
3	6,200
4	9,400
5	11,700
Total	33,600

Under present conditions, 29,227 tons of sediment per year are being delivered to Calcasieu River and Bayou Serpent. With the

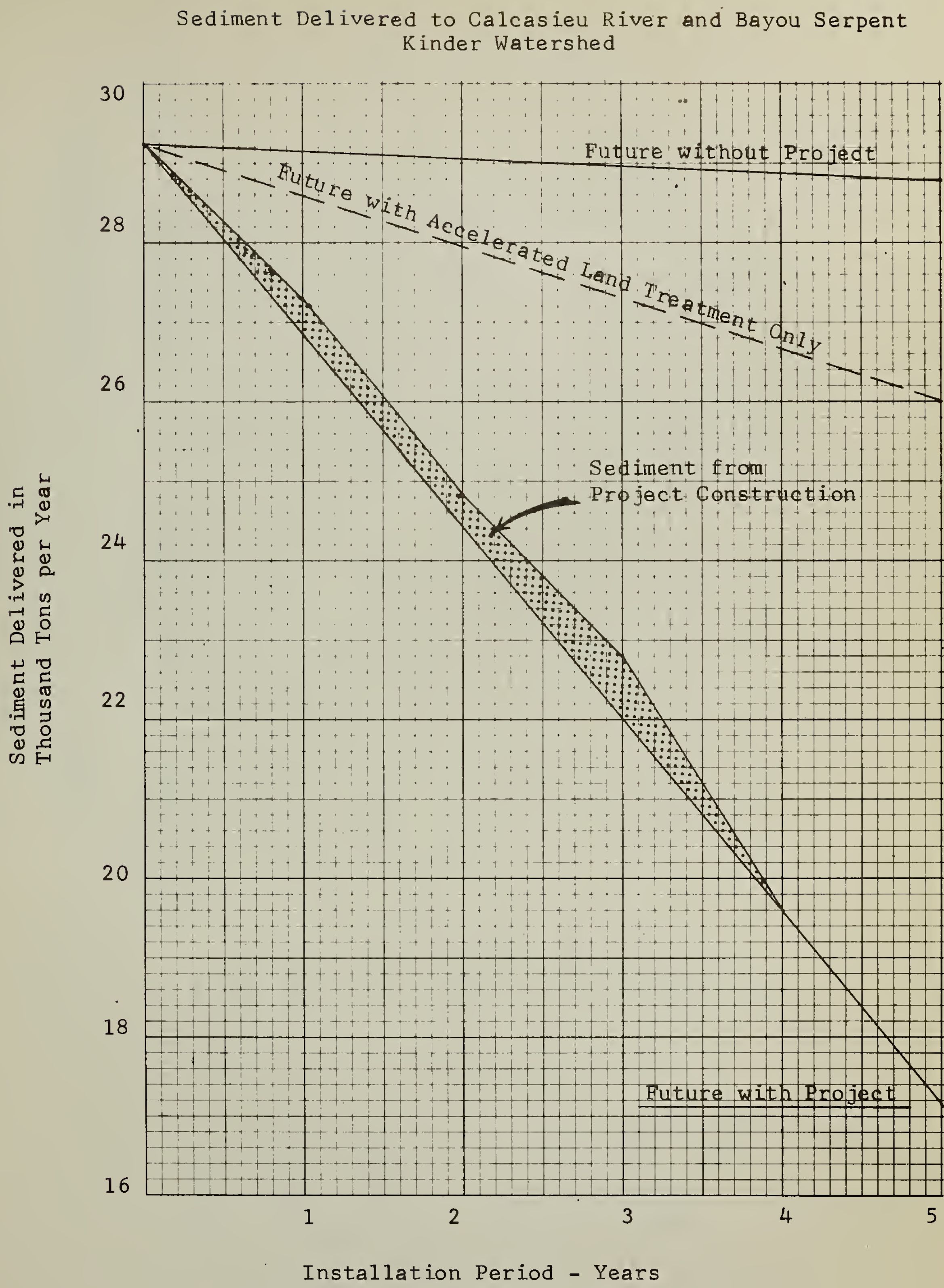
project in place, 17,165 tons of sediment per year will be delivered. This is a reduction of 12,062 tons per year or 41 percent. This reduction reflects not only the reduction in sheet erosion but also the trapping effect of the structures for water control (weirs) that will be installed.

Calculations indicate that an average of 440 tons of sediment per year for three years will be generated by construction. Several practices are planned which will reduce the amount of sediment derived from channel construction. Excavation will be done so that it only affects one bank. Vegetative plantings on the disturbed soil will be accomplished immediately after construction. Since they will be installed prior to the excavation upstream of their location, structures for water control (weirs) will trap a large percent of the sediment produced. Construction-induced sediment will be offset by reductions that will be achieved by land treatment and structural measures. This is illustrated by the graph on page 88.

The graph shows the present rate of sediment being delivered to the Calcasieu River and Bayou Serpent at the watershed boundary, the amount of sediment that will be generated by construction, the future rate without project, the future rate with accelerated land treatment only, and the future rate with project. The rate of sedimentation for these various conditions is plotted versus the installation period of 5 years.

During project installation, excavation of project channels will cause about 7,697 tons of material to be eroded. During the same period of time, land treatment measures will reduce sheet erosion from 81,157 tons per year to 71,009 tons per year, a reduction of about 12 percent. Structures for water control (pipe drops) will reduce gully-type erosion that exists where field ditches enter main or lateral channels by 400 tons per year. The tabulations on page 90 provide more detailed information regarding these statements.

Sedimentation is a direct result of erosion, but all material that is eroded is not delivered to the outlets of channels. Computations were made of the amount of sediment being delivered to the Calcasieu River and to Bayou Serpent at the watershed boundary. The delivery ratio used is based on the drainage area and further modified by structures for water control (weirs) that will be installed in Channel Systems M-1, M-2, and M-5 prior to construction. The tabulations on pages 89 and 90 show the various amounts of erosion and resulting sediment being deliverd to these localities.


Sediment Delivered to Calcasieu River and Bayou Serpent
Kinder Watershed
Sediment Delivered in Thousand Tons per Year
30
28
26
24
22
20
18
16
1
2
3
4
5
Installation Period - Years
Future without Project
Future with Accelerated Land Treatment Only
Sediment from Project Construction
Future with Project

Sheet Erosion - by Land Use

Land Use	Present			Future With Project		
	Acres	Average Sheet Erosion (tons/year)	Average Sheet Erosion (tons/acre/year)	Acres	Average Sheet Erosion (tons/year)	Average Sheet Erosion (tons/acre/year)
Rice	11,600	17,017	1.47	11,600	15,206	1.31
Rice - Rotation Pasture	4,000	4,120	1.03	1,200	637	0.53
Rice - Rotation Soybeans	16,000	36,955	2.31	22,446	42,736	1.90
Fallow	4,000	12,485	3.12	500	1,561	3.12
Truck Crops	100	293	2.93	100	253	2.53
Unimproved Pasture	400	87	0.22	100	16	0.16
Improved Pasture	800	50	0.06	700	22	0.03
Forest Land	38,850	2,425	0.06	38,633	2,412	0.06
Other	8,250	7,725	0.94	8,721	8,166	0.94
TOTAL	84,000	81,157	0.97	84,000	71,009	0.85

Results of Construction

Channel System	Excavation (linear feet)	Erosion (tons)	Sediment Delivered To Calcasieu River (tons)	Sediment Delivered To Bayou Serpent (tons)
M-1	116,000	2,855	286	---
M-2	45,700	1,036		104
M-3 & M-4	6,300	111	111	---
M-5 & M-6	142,100	3,344	669	---
M-7	14,300	351	140	---
Total	324,400	7,697	1,206	104

Sediment Delivered Annually to Calcasieu River and Bayou Serpent from Sheet Erosion in the Watershed

Channel System	Calcasieu River		Bayou Serpent	
	Present (tons)	Future With Project (tons)	Present (tons)	Future With Project (tons)
M-1	8,188	3,902		
M-2			8,065	2,482
M-3 & M-4	1,269	1,119		
M-5 & M-6	6,113	4,238		
M-7	1,063	895		
Sub-Total	16,633	10,154	8,065	2,482
Other	4,529	4,529		
Total	21,162	14,683	8,065	2,482

Water entering Calcasieu River from the watershed has an estimated average suspended sediment concentration of 154 mg/l. With the project installed, this concentration will be reduced to 107 mg/l.

Evaluation Unit IV (Channel M-5 and M-6) drains into the Calcasieu River immediately upstream from an existing low-level dam in the river. This dam was built by the Louisiana Department of Public Works and aids in the recharge of the Chicot Aquifer. At the present time, Evaluation Unit IV contributes approximately 6,000 tons of sediment per year to the river at this critical location. With the project installed, this sediment discharge will be reduced to an estimated 4,000 tons per year. This 33-percent reduction will help maintain the effectiveness of this dam for recharge.

Fish and Wildlife and Recreation

Six structures for water control will be installed resulting in 11 miles and 36 acres of additional ponded water. A combination of ephemeral and intermittent flows currently exists in these 11 miles of channels. The structures will have a beneficial effect upon the aquatic environment within the channels and downstream. Although the 36 acres of water will not be high quality fishery, it will support a standing crop of about 15 pounds per acre. Species composition is expected to be dominated by commercial species such as carp, shad, and catfishes. Few people will visit these sites since the habitat created will be of relatively low value for recreation. Impacts of these few visitations on aesthetics, serenity of the countryside, and other environmental factors will be minimal. Shallow water at the upper reaches of each permanent water pool will provide additional habitat for wading birds. Occasional periods of aquatic weed growth may occur in these shallow areas.

Anabaena and *Microcystis* are the species of blue-green algae most likely to occur during periods of low flow. Their presence would detract from the aesthetics of the water. These algae "blooms" could also affect fish by (1) emitting a substance which in sufficient quantity is toxic and (2) causing an oxygen shortage when they decompose. These algae will be controlled by pesticides approved by the United States Environmental Protection Agency and the United States Department of Agriculture.

Species of aquatic macrophytes which may occur in the shallow water areas are not certain at this time. Possible species are pondweed, najas, muskgrass, bladderwort, coontail, cat-tail, and duckweed. These are not expected to occur in sufficient quantities to affect fisheries.

EFFECTS

Intermittent flow channels totaling 10.0 miles will be modified by project action. Of this total, 7.1 miles will be enlarged and 2.9 miles will be cleared. These channels have been previously modified.

Although of low quality and quantity, fisheries will be adversely affected by the disturbances of 10.0 miles of intermittent channels. This will be caused by losses of channel and bank cover, disruption of the bottom community, and lowering of the base food chain. The diversity of fish species will be lowered causing a higher preponderance of commerical species such as carp, gar, shad, and catfish. Water temperature will not significantly change in intermittent channels because these channels contain water only during winter and spring.

Sixty-three miles of ephemeral flow channels will be worked. Limited production of fish food organisms such as crawfish and larval forms of insects occurs in these channels. This production will be temporarily interrupted during construction.

Turbidity in Calcasieu River at project channel outlets will temporarily increase during construction of the channels. Reductions of phytoplankton and other aquatic organisms will occur locally during this period. Neither the fish species diversity nor the standing crop will be lowered because of (1) the short duration of the construction process, (2) dilution by the much larger river flow, and (3) the buffer zone of forested vegetation between construction sites and the river. Eutrophication is not a problem in this portion of Calcasieu River. This is a result of the large forested drainage area above the project area, the substantial perennial flow, and the sand in the streambed. These factors significantly limit aquatic enrichment. Eutrophication processes will remain about the same with the project installed.

Project construction will not affect any of the existing 25 ponds. The planned construction will not create any additional farm ponds but landowners will probably build new ponds during the life of the project. Encouraging private owners to allow public fishing on these ponds will help keep fish populations within limits which permit normal growth.

The problem of pesticides as pollutants is complex. Chlorinated hydrocarbons break down slowly. Use of some of these chemicals for control of insects on crops is presently prohibited. Research is currently underway to find pesticides whose residues will not remain in the food chain for long periods of time. Epps, et al., in a study entitled "Preliminary Report on a Pesticide Monitoring Study in Louisiana", found residue levels to be related to pesticide usage.

EFFECTS

Currently the Soil Conservation Service, in cooperation with other Federal and State agencies, has a monitoring program to determine residue levels in watershed project areas. The Plaquemine Brule Watershed, located about 30 miles southeast of Kinder, is included in this monitoring program. Periodic samples of water, bottom sediment, and fish are collected and analyzed for chlorinated hydrocarbons. This data has been collected for 1 year and will continue for 4 more years.

Recognizing the inconclusiveness of 1 year of monitoring, the results of the first year of testing indicate the following:

1. Use of chlorinated hydrocarbons appears to be decreasing.

2. Water samples do not contain detectable amounts of chlorinated hydrocarbons.

3. Bottom sediment and fishes do contain chlorinated hydrocarbons, the probable reason being residues from applications in past years.

Although a monitoring program is not being conducted in Kinder Watershed, results of such analyses would be expected to be similar to those obtained for Plaquemine Brule Watershed. Conditions in these two watersheds are similar.

Thirty-three farmers representing 10 percent of Plaquemine Brule Watershed were interviewed to acquire data on types and amounts of pesticides applied to crops. Results of this survey are found on the following page and show that 17 different pesticides are currently being used of which only 5 are insecticides. Aldrin and toxaphene are two of these insecticides. By comparison, results from the 1-year samples show that fish species contain the following chlorinated hydrocarbons:

BHC (white crappie had .01 ppm and short nose gar had .02 ppm)
DDT (white crappie had .13 ppm and short nose gar had 2.69 ppm)
Toxaphene (white crappie had .27 ppm and short nose gar had 4.2 ppm)
Dieldrin (bluegill had .04 ppm and short nose gar had .57 ppm)

Gizzard shad were also analyzed for the above pesticides and levels ranged in between the low and high listed for white crappie, short nose gar, and bluegill. Bottom sediment contained DDT (0.09 ppm to 0.13 ppm) and Dieldrin (0.0 ppm to 0.01 ppm).

Pesticide Usage Survey of
Bayou Plaquemine Brule Watershed[a]
1973

PESTICIDE	Application rate/acre[b]	Acres receiving application[c]	Percent of farms using listed pesticide[d]	Total volume applied
FUNGICIDES				
Captan	3½ lbs/ac	5,800	72	20,300 lbs
HERBICIDES[e]				
Alachlor	3 qts/ac	3,495	48	2,620 gals
Fluometuron	2-8 lbs/ac	330	3	9,240 lbs
Linuron	1 lb/ac	1,375	21	1,375 lbs
Molinate	30 lbs/ac	1,160	33	34,800 lbs
MSMA	1-2 lbs/ac	330	3	495 lbs
Nitralin	4 qts/ac	300	9	300 gals
Propanil	4 qts/ac	3,180	51	3,180 gals
Propanil and Molinate (mixed)	3 qts/ac (each)	90	9	330 gals
Trifluralin	1 lb/ac	450	15	450 lbs
2,4-D	1 qt/ac	420	15	105 gals
2,4-DB	2 lbs/ac	100	3	200 lbs
INSECTICIDES[f]				
Aldrin[g]	3½ lbs/ac	5,890	72	20,615 lbs
Carbaryl	1½ lbs/ac	310	6	470 lbs
Carbofuran	17 lbs/ac	755	15	12,835 lbs
Methyl Parathion	1 qt/ac	1,225	21	305 gals
Toxaphene[g]	1 lb/ac	260	3	260 lbs

a/ Data prepared by District Conservationist from a survey of 33 farms, comprising a representative sample of 10 percent of the land area.

b/ Application rates based on average rates used by four local flying services.

c/ No pesticides were used on 7,285 acres; one or more pesticides were used on 12,885 acres.

d/ No pesticides were used on 12 percent of farms surveyed.

e/ Most herbicides are applied only once per crop season.

f/ Number of applications varies, depending upon degree of infestation during crop season.

g/ Denotes chlorinated hydrocarbons.

EFFECTS

Sixty acres of Type 1 wetlands (seasonally flooded hardwoods) will be affected by project construction. The value of the wetland will be reduced as a waterfowl feeding area. The design of Channel M-2 is such that the amount and duration of water on the wetland as a result of direct precipitation will not be affected. However, water introduced onto the wetland as a result of overbank flooding will be reduced on low intensity rainstorms. Fifteen acres of mixed hardwoods will be cleared from these wetlands for channel enlargement and spoil placement. The remaining 695 acres of Type 1 wetlands and 65 acres of Type 5 wetlands will not be affected by project action.

Game species including deer and squirrels now maintain higher populations on existing habitat conditions along channel rights-of-way than will be present following the project. These animals will be adversely affected by the loss of 168 acres of forest land habitat. However, additional browse and cover will be available on the spoil and berms for wildlife.

Postproject rabbit habitat along channels in forest land and wooded channels should be as good as preproject habitat once vegetation is established on berms and spoil. However, the enlargement of channels will result in a loss of rabbit habitat of 90 acres.

Bobwhite quail and doves will be temporarily benefited. Conversions of forest along channels will result in 317 acres of habitat for doves and quail. After a period of about 3 years, the open land conditions will change to a brush-type habitat causing its usefulness for doves and quail to diminish. The following summary exhibits construction effects on game animals:

Species	Habitat	Acres	Number of Animals
Deer	Forest land	-168	- 3
Squirrels	Forest land	-168	- 56
Rabbits[a/]	Forest land and open land	- 90	- 30
Doves[b/]	Open land	+317	+150
Quail[b/]	Open land	+317	+ 21
Waterfowl (Migratory)	Forest land	-168	- 8

a/ Loss computed only on land taken up by channels. The seeded berms and spoil will be as good or better as the habitat existing with preproject conditions.

b/ After a period of about 3 years, the open land condition will change to a brush-type habitat causing its usefulness to diminish.

EFFECTS

The red-cockaded woodpecker, and "endangered" species, is found near Channel M-7. Construction on this channel will be terminated 500 yards from the closest nest tree. Stopping construction at this distance will avoid disturbing the woodpeckers' habitat. Research on red-cockaded woodpeckers has determined that the territory of a pair varies from 25 to 42 acres.[5]

The impacts of this project on the "endangered" or "status-undetermined" species that could possibly occur or be occasional visitors will be minimal. However, the cumulative impact of this project and many similar projects is further deleting habitat for these animals.

Economic and Social

The economic base of the watershed, agriculture, will be enhanced. The project will increase agricultural development which in turn will stimulate the business and increase the profits of processors and sellers of agricultural products as well as other goods. The economy of the area will be enhanced by the higher salaries of those presently employed and those hired to do the additional work.

The gross sales of farm products are expected to increase by approximately 20 percent. Expenditures for production inputs required to obtain these higher gross sales are expected to increase by approximately 11 percent.

The greater level of protection and consequent reduced cost of production and increased quality of products will give farmers an incentive to increase production inputs. They will buy better quality seed and will use more fertilizer and lime. It is expected that they will spend an additional $45,000 buying 750 tons of fertilizer annually which will be necessary to attain the higher yields of the future. There will be increases in expenditures for fuel and other petroleum products which will be used in harvesting and hauling the product to market. This will stimulate economic activity within the watershed

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5/ Gilbert T. Crosby, "Home Range Characteristics of the Red-Cockaded Woodpecker in North-Central Florida," The Ecology and Management of the Red-Cockaded Woodpecker (Tallahassee: Tall Timber Research Station, May 1971), p. 67.

as well as the surrounding areas. More jobs will be created in the processing and service industries. The value of property will increase which will provide a higher tax base. Thus, the parish will have more funds to develop health, recreational, educational, and other needed facilities.

Installation of the project will create about 37 man-years of local labor for a 3-year period. The expenditure of $877,500 for the installation of land treatment measures will create an additional 25 man-years of labor over a 5-year period. Operation and maintenance will provide 1 man-year annually of local labor for the life of the project.

The project will help slow the trend of decreasing number of farms and increasing size. With the project, optimum sized, labor saving equipment will be more efficiently used on the farms. This and other factors will decrease cost, increase yields, and increase net returns. This in turn will increase the profitability of farming. This will cause farming to be more competitive with other industries which will slow the out-migration trend.

The average annual overall net farm income will increase about $2,500 per farm. With this increased and more stable income, the farmer may improve his house or buy a better automobile. Farmers will be able to afford better dental and health care, more insurance, better clothes, and other amenities of life for their families. The increased farm output will enable farm managers to pay employees higher wages which in turn will help improve living conditions.

The problem caused by flooded roads will be reduced for watershed residents. Schoolbuses will be able to travel their scheduled routes more regularly which will improve school attendance. The general public will be better able to utilize the roads for farming operations and marketing, and for commuting to places of employment and business during wet periods. Nuisance damages to residences will be reduced.

Local traffic patterns will be interrupted temporarily during the replacement of bridges and culverts resulting in inconveniences to the people involved. Detour routes will be available such that no one will be deprived of access to their destination. Noise levels will increase at the construction sites. Increases in turbidity will occur downstream temporarily until the exposed areas are revegetated.

Benefits will accrue from the financial and technical assistance made available for the installation of the project. This will bring outside monetary resources into the community and will provide an opportunity to use goods, services, and labor from the local area. The use of unemployed or under-employed local labor will be

needed during project installation and throughout project life for normal operation and maintenance.

Local secondary benefits will accrue after the installation of project measures. The values added to the immediate products and services as a result of activities stemming from or induced by the project will enhance the overall local economy. The increased production of goods stemming from the project will place new demands on the processing, transporting, and marketing industries within the area. Because the only processing facility is a grain elevator, the effects on this type facility will be less than on the transporting and marketing sectors. Processors, business establishments, and other individuals not directly benefited will profit from increased sales of their agriculturally associated goods and products. Suppliers of the needed materials and services required to make possible the benefits expected from installation of the project will realize an increased net income. Increased production of goods and services induced by the project will tend to stimulate local economic activity. Because most of the products are processed outside the watershed, economic activity in the region will also be increased.

Areas of Natural Beauty

The installation of project measures in a manner which will be least damaging to fish and wildlife will maintain and, in some cases, improve areas of natural beauty. Pecan and various species of oak trees which will be planted will increase aesthetic values. Leaving selected trees on the channel berm will interrupt the open view creating a varied scene of natural beauty. Excavation from only one side of the channels will leave the opposite side in its natural state. Shaping the spoil according to design and revegetating channel side slopes, berms, and spoil on the disturbed side will present a pleasant green belt appearance. Improved agricultural production as a result of the project will present attractive pastoral scenes.

Archaeological, Historical, and Scientific

There are no properties listed in the National Register of Historical Places that will be affected by installation of structural measures. This project will have no effect on any known archaeological or historical sites.

PROJECT BENEFITS

Flood damage reduction benefits (table 5) totaling $245,800 consist of $225,000 from crop and pasture, $8,700 from roads and bridges, and $12,100 from indirect damages. Benefits from other sources (table 6) include $50,200 from more intensive land use, $225,000 from drainage, $15,400 from redevelopment, and $90,100 from local secondary. Total benefits will amount to $626,500 annually.

Secondary benefits from a national viewpoint will accrue from this project, but these were not evaluated. There are other benefits which accrue in the watershed as indicated in the EFFECTS OF WORKS OF IMPROVEMENT section. However, no attempt was made to evaluate them from a monetary standpoint.

COMPARISON OF BENEFITS AND COST

Average annual project benefits from structural measures are $626,500. The average annual cost of structural measures (amortized installation cost plus operation and maintenance) is $142,900, providing benefit-cost ratio of 4.4 to 1 (table 6). Total average annual benefits excluding secondary benefits are $536,400, providing a benefit-cost ratio of 3.7 to 1.

PROJECT INSTALLATION

This project will be carried out over a 5-year period. Land treatment will require the entire 5-year period; structural measures will be installed during the first 3 years. The Sponsoring Local Organization understands its obligations and has agreed to carry out the work during this period.

The Calcasieu and the Gulf Coast Soil and Water Conservation Districts will provide overall leadership necessary for application of land treatment measures. Landowners and operators will be encouraged to apply and maintain all needed measures on their land. A study of completed projects with similar purposes shows that planned land treatment can be accomplished during the project installation period. Plans for their installation and maintenance will be outlined with each landowner. The agreed-to items will be identified in a conservation plan which will be executed between the individual and the soil and water conservation district.

Forest landowners will be encouraged to apply and maintain the recommended forestry measures on their lands. Technical assistance, now provided by the Louisiana Forestry Commission in cooperation with the U.S. Forest Service under the Cooperative Forest Management Program, will be increased to accelerate the installation of forestry measures. A forester will be assigned to the project to guide and assist the landowners in installation of planned forestry measures. He will assist in the preparation of forest management plans based upon multiple use of forested lands as part of the conservation farm plans.

The Kinder Drainage District No. 2 and the Jefferson Davis Parish Consolidated Gravity Drainage District No. 1 will be responsible for carrying out all contracting for installing all other structural measures. The Kinder Drainage District No. 2 will deal directly with the Service during the installation of structural measures in Allen Parish and likewise the Jefferson Davis Parish Consolidated Gravity Drainage District No. 1 will work directly with the Service during the installation of structural measures in Jefferson Davis Parish. They will be responsible for the local share of the cost of construction, acquiring necessary land rights, obtaining improvement changes to all roads, bridges, culverts, utilities, and other existing improvements which are needed, and for advertising, awarding, and administering contracts. These districts have power of expropriation and have agreed to use this power as necessary to obtain needed land, easements, and rights-of-way. Land easements and rights-of-way will be acquired by using Louisiana revised statute 38:113, signing of flowage easements, and when necessary by fee simple title. Appraisals necessary for purchase easements will be acquired through reputable land and property appraising institutions.

INSTALLATION

Construction permits will probably be required by the U.S. Corps of Engineers (Engineering Regulation 40.1165-2-362). These permits will be obtained (as necessary, by the Sponsoring Local Organization prior to the installation of the associated structural measures).

The Service will perform all necessary engineering services required for installation of the planned measures.

The channel work normally will progress in an upstream direction. The only condition foreseen where this procedure will not be adhered to is when thickly vegetated sections of channels are left as buffers to absorb sediment from construction. When construction upstream is completed, the buffer zone downstream will be removed. Care will be exercised to insure that the modification or reconstruction of bridges, culverts, or other existing facilities will occur either before or concurrently with channel improvement. This way they will not be a deterrent to the proper functioning of planned measures.

Investigations conducted during the development of this plan indicate that no displacement or relocations of persons, business, or farm operations will be necessary. However, if conditions should change and relocations are involved, the Sponsors will provide decent, safe, and sanitary replacement housing for all persons subject to displacement. The displaced persons will be given notice to vacate at least 90 days before they have to move. Relocation payments will be cost shared by the Sponsors and Service in the proportions shown in the Work Plan Agreement.

FINANCING PROJECT INSTALLATION

Federal assistance will be provided under the authority of the Watershed Protection and Flood Prevention Act (Public Law 566, 83d Congress; Stat. 666) as amended. This assistance is subject to appropriation of funds.

The cost of applying land treatment measures will be borne by the owners and operators of the land with aid from Federal and State programs. Technical assistance to the landowners and operators will be provided by the Soil Conservation Service and the U.S. Forest Service cooperating with the Louisiana Forestry Commission under going programs. Funds for the acceleration of technical assistance necessary to insure timely installation of land treatment measures and for soil surveys will be provided by Public Law 566.

The Louisiana Department of Public Works has agreed to provide funds for the local share of cost of structural measures contingent on the appropriation of monies for this purpose by the Louisiana Legislature. The local Sponsors recognize, however, that these funds may not be available or that additional funds may be required. They will be responsible for obtaining additional financing as necessary through normal funding procedures such as taxes or bond issues.

The project Sponsors responsible for managing the finances of work in which the SCS has a financial interest will develop and maintain a financial management system. This system will contain provisions for maintaining accurate, current, and complete disclosure of financial transactions, budgetary actions and provision for audits. The system will be developed in accordance with and contain provisions set forth by SCS policy.

PROVISIONS FOR OPERATION AND MAINTENANCE

Operation and maintenance of all phases of the completed project will be the responsibility of the Sponsors. Individual landowners and operators will have the responsibility for maintaining land treatment measures. The Louisiana Forestry Commission, in cooperation with the U.S. Forest Service, will furnish technical assistance necessary for maintaining forest land treatment measures under the going Cooperative Forest Management Program. The Federal-State Cooperative Fire Control Program will continue to furnish fire protection for the watershed area. The Calcasieu and the Gulf Coast Soil and Water Conservation Districts with technical assistance from the Soil Conservation Service will assist and encourage landowners to maintain land treatment measures. The objectives will be to maintain adequate drains, ground cover, and other practices which will protect and conserve soil and water resources.

Operation and maintenance of all phases of the completed structural measures will be the responsibility of the Kinder Drainage District No. 2 and Jefferson Davis Parish Consolidated Gravity Drainage District No. 1. In addition to maintaining structural measures proposed in the plan, the districts will continue to maintain channels that are now adequate, as indicated on the Project Map, Figure 4. The methodical operation and maintenance of structural measures will insure proper functioning of these measures and realization of effects.

The present 4-mil maintenance tax for drainage is considered adequate for maintaining channels and associated works. If these funds should prove inadequate, the financial arrangement discussed under FINANCING PROJECT INSTALLATION will be used. Annual expenses, including the replacement and regular operation and maintenance, are estimated to be $27,300. Channel maintenance includes such activities as periodic cleanouts necessary to restore channels to their planned capacities, patching of eroded areas and washouts on channel banks, control of aquatic weeds that would reduce channel capacities, and repair or replacement of side inlets and other structures. Maintenance of structures for water control includes repairing rills around headwalls or wingwalls, replacing of rock riprap as needed, maintaining or replacing vegetation on fills, repairing or replacing worn or broken parts, replacing short life parts, and all other activities essential to the safety and functioning of the structures. Maintenance and improvement of the general attractiveness or beauty of the channel and structure sites shall be considered an important feature of the maintenance program.

PROVISIONS

Existing public roads, farm roads, turn rows, trails, open areas, and other existing facilities will be used for maintenance equipment to reach the channels. If none are existing, travel ways will be provided. The channels will be kept clear of excessive vegetation by mowing, hand labor and use of approved herbicides. Herbicides such as ammonium sulfamate, bromacil, and others registered with the Environmental Protection Agency (EPA) will be applied in a manner consistent with their labeling. Copper sulfate and cutrine will be used to control algae before excessive "blooms" develop in areas upstream from the six structures for water control (weirs). Pesticides presently approved will not preclude the use of other EPA registered and USDA approved pesticides developed during the life of the project. Spraying will be accomplished in the summer months when the ephemeral channels and most of the intermittent channels are most likely to have the least flow. Spraying during these months will be more effective and will lower the probability of runoff carrying herbicides into other areas. Structures for water control (weirs and pipe drops) will be repaired when in need. Two mechanical cleanouts are anticipated during the life of the project. The amount of sediment to be removed each time will be small enough to be placed and smoothed on the berm.

Special operation and maintenance procedures are required for Channel M-7 in the vicinity of the colony of red-cockaded woodpeckers. No mechanical maintenance equipment is to be used within approximately 500 yards of the nesting area.

The effective area of flow of Channel M-7 in the vicinity of the woodpecker colony is a broad valley with a small pilot channel in the bottom. Its present land use is forest and range for a few cattle. As a result of this use and forestry management that has occurred in the past, the trees are sparse with very little woody understory vegetation present. As long as there is no land use change in the area of flow described, very little or no need for maintenance is anticipated.

Provisions will be made for representatives of the Soil Conservation Service, the Louisiana Department of Public Works, and the local Sponsors to have free access to all portions of the works of improvement at any reasonable time for the purpose of inspection, repair, and maintenance. The local Sponsors, together with representatives of the Soil Conservation Service, will make a joint inspection annually, after severe storms, and after the occurrence of any other unusual condition that might adversely affect the structural measures.

Joint inspections will continue for 3 years following completion of installation of the structural measures. Inspection after the third year will be made by the Sponsors who will prepare an annual report and send a copy to the Soil Conservation Service. Items of inspection will include, but will not be limited to, conditions of vegetative cover and growth, need for removal of sediment bars and debris accumulations, brush control, and general condition.

PROVISIONS

The Sponsoring Local Organization fully understands its obligations for operation and maintenance and will execute a specific operation and maintenance agreement with the Soil Conservation Service prior to the execution of the project agreement for the installation of works of improvement. The method in which operation and maintenance is to be accomplished will be in accordance with procedures outlined in the Soil Conservation Service <u>Operation and Maintenance Handbook for Louisiana</u>.

TABLE 1 - ESTIMATED PROJECT INSTALLATION COST

Kinder Watershed, Louisiana

Installation Cost Item	Unit	Number Non-Federal Land	Estimated Cost (Dollars)1/ P.L. 566 Funds SCS3/	FS3/	Total	Other SCS3/	FS3/	Total	TOTAL
LAND TREATMENT									
Land Areas2/									
Cropland	Acres	16,600				720,200		720,200	720,200
Pastureland	To Be	400				50,100		50,100	50,100
Forest Land	Treated	2,500				2,000	3,100	5,100	5,100
Other Land		150				~~9,000~~		9,000	9,000
Individual Practices									
Fire Prevention Contactor	-	-		32,400	32,400		6,000	6.000	38,400
Technical Assistance	-	-	64,500	16,200	80,700	37,600	3,000	40,600	121,300
TOTAL LAND TREATMENT			64,500	48,600	113,100	818,900	12,100	831,000	944,100
STRUCTURAL MEASURES									
Construction									
Channel Work4/									
M	Miles	63	725,900	-	725,900	241,900	-	241,900	967,800
O	Miles	1C	61,900	-	61,900	20,700	-	20,700	82,600
Subtotal-Construction			787,800	-	787,800	262,600	-	262,600	1,050,400
Engineering Services			73,600	-	73,600	-	-	-	73,600
Relocation Payments			-	-	-	-	-	-	-
Project Administration									
Construction Inspection			105,200	-	105,200	-	-	-	105,200
Other			97,500	-	97,500	11,600	-	11,600	109,100
Relocation Assistance Advisory Services			-	-	-	-	-	-	-
Subtotal-Administration			202,700	-	202,700	11,600	-	11,600	214,300
Other Costs									
Land Rights			-	-	-	584,100	-	584,100	584,100
Subtotal-Other			-	-	-	584,100	-	584,100	584,100
TOTAL STRUCTURAL MEASURES			1,064,100	-	1,064,100	858,300	-	858,300	1,922,400
TOTAL PROJECT			1,128,600	48,600	1,177,200	1,677,200	12,100	1,689,300	2,866,500

1/ Price base 1974.
2/ Includes only areas to be adequately treated during the project installation period. Treatment will be accelerated throughout the watershed, and dollar amounts apply to total land areas, not just to adequately treated areas.
3/ Federal agency responsible for assisting in installation of works of improvement.
4/ Type of channel prior to project:
(N) Unmodified well-defined natural channel or stream
(M) Manmade or previously modified channel
(O) None or practically no defined channel

May 1974

TABLE 1A - STATUS OF WATERSHED WORKS OF IMPROVEMENT

Kinder Watershed, Louisiana

	Unit	Applied To Date	Total Cost[1/] Dollars
Land Treatment			
Access Road	Ft.	31,680	634
Conservation Cropping System	Ac.	24,031	364,558
Crop Residue Management	Ac.	13,604	66,812
Leferred Grazing	Ac.	857	771
Pond	No.	14	9,800
Fishpond Management	No.	28	840
Irrigation Pipeline	Ft.	4,517	17,011
Irrigation System, Surface & Subsurface	No.	20	20,000
Irrigation Water Management	Ac.	3,930	35,370
Irrigation Land Leveling	Ac.	-	-
Land Smoothing (Acres)	Ac.	10,300	194,400
Land Smoothing (Mound Acres)	Ac.	2,407	168,490
Pasture and Hayland Management	Ac.	700	14,000
Pasture and Hayland Planting	Ac.	700	42,000
Proper Grazing Use	Ac.	3,054	6,108
Structure for Water Control	No.	15	2,250
Well	No.	12	6,000
Wildlife Wetland Habitat Management	Ac.	100	10
Wildlife Upland Habitat Management	Ac.	33	10
Timber Stand Improvement	Ac.	63	1,300
Site Preparation for Planting	Ac.	90	2,300
Tree Planting	Ac.	1,843	36,900
TOTAL			989,564

1/ Price Base: 1974

May 1974

TABLE 2 - ESTIMATED STRUCTURAL COST DISTRIBUTION

Kinder Watershed, Louisiana

(Dollars)1/

Item	Installation Cost - P.L. 566 Funds			Installation Cost - Other Funds			Total Installation Cost
	Construction	Engineering	Total Public Law 566	Construction	Land Rights	Total Other	
CHANNEL WORK							
Evaluation Unit I							
M	334,900	31,300	366,200	111,600	184,700	296,300	662,500
Subtotal	334,900	31,300	366,200	111,600	184,700	296,300	662,500
Evaluation Unit II							
M	7,700	700	8,400	2,500	7,400	9,900	18,300
Subtotal	7,700	700	8,400	2,500	7,400	9,900	18,300
Evaluation Unit III							
M	166,100	15,500	181,600	55,400	121,700	177,100	358,700
Subtotal	166,100	15,500	181,600	55,400	121,700	177,100	358,700
Evaluation Unit IV							
O	60,100	5,600	65,700	20,100	98,800	118,900	184,600
M	205,600	19,200	224,800	68,500	155,600	224,100	448,900
Subtotal	265,700	24,800	290,500	88,600	254,400	343,000	633,500
Evaluation Unit V							
O	1,800	200	2,000	600	900	1,500	3,500
M	11,600	1,100	12,700	3,900	15,000	18,900	31,600
Subtotal	13,400	1,300	14,700	4,500	15,900	20,400	35,100
TOTAL	787,800	73,600	861,400	262,600	584,100	846,700	1,708,100
Project Administration	xxxx	xxx	202,700	xxx	xxx	11,600	214,300
GRAND TOTAL	787,800	73,600	1,064,100	262,600	584,100	858,300	1,922,400

1/ Price base 1974.

May 1974

TABLE 2A - COST ALLOCATION AND COST SHARING SUMMARY

Kinder Watershed, Louisiana

(Dollars)1/

Item	Cost Allocation			Cost Sharing					
	Purpose			Public Law 566			Other		
	Flood Prevention	Drainage	Total	Flood Prevention	Drainage	Total	Prevention	Drainage	Total
MULTIPLE PURPOSE									
Channel Work With Appurtenant Structures	854,000	854,100	1,708,100	562,000	299,400	861,400	292,000	554,700	846,700
TOTAL	854,000	854,100	1,708,100	562,000	299,400	861,400	292,000	554,700	846,700

1/ Price base 1974.

May 1974

TABLE 3 - STRUCTURE DATA

CHANNELS

Kinder Watershed, Louisiana

Channel	Station	Drainage Area	Capacity Req'd	Capacity Des.	Water Surf. Elev.	Hydr. Grad.	Channel Dimensions Bottom Width	Bottom Grade	Flow Depth	Side Slope	"n" Value Aged	"n" Value As Built	Velocities Aged	Velocities As Built	Excavation	Inventory of Chan. Work Type of Work	Type Chan. Before Proj.	Flow Cond. Before Proj.
		sq mi	cfs	cfs		ft/ft	ft	%	ft				fps	fps	cu yd			
M-1	563+28	0.62	34	35	42.3	0.00020	10.0	0.06	3.1	1.5:1	0.045	0.025	0.78	1.40		II	M	E
	543+63	0.89	46	47	41.7	0.00020	10.0	0.06	3.6	1.5:1	0.045	0.025	0.84	1.51		II	M	E
	525+03	1.47	206 [2]	198	42.7	0.00020	18.0	0.01	5.7	1.5:1	0.040	0.025	1.31	2.10		II	M	E
	462+63	1.93	251 [2]	255	40.9	0.00020	20.0	0.18	5.8	1.5:1	0.035	0.022	1.53	2.38		II	M	E
	457+63	3.23	364 [2]	508	40.8	0.00020	23.0	0.18	7.3	1.5:1	0.030	0.020	2.05	3.08		II	M	E
	428+63	6.16	665 [2]	669	40.2	0.00020	24.0	0.00	8.3	1.5:1	0.030	0.020	2.21	3.32		II	M	E
	415+80	6.38	230	391	38.2	0.00035	23.0	0.00	5.9	1.5:1	0.035	0.022	2.08	3.24		II	M	E
	375+10	6.69	239	236	36.8	0.00035	23.0	0.00	4.8	1.5:1	0.040	0.025	1.63	2.61		II	M	E
	342+70	10.72	352	359	35.7	0.00035	23.0	0.02	5.6	1.5:1	0.035	0.022	2.04	3.17		II	M	E
	240+68	14.75	467	466	32.6	0.00030	27.0	0.04	6.3	1.5:1	0.035	0.022	2.03	3.16		II	M	I
	125+50	20.38	596	583	30.9	0.00015	40.0	0.01	6.6	1.5:1	0.030	0.020	1.80	2.70		II	M	I
	90+00	24.15	680	695	30.4	0.00015	40.0	0.02	7.2	1.5:1	0.030	0.020	1.90	2.85	370050	II	M	I
	25+00	24.82	690	703	29.4	0.00015	A= 384.00		P= 73.00		0.030	0.020	1.83	2.75		IV	M	I
	0+00	25.15	694	1441	29.0	0.00015	A=1124.00		P= 170.00		0.050	0.050	1.28	1.28		VI	N	I
L-1A	120+74	1.10	55	55	37.3	0.00080	8.0	0.01	3.0	1.5:1	0.045	0.025	1.47	2.65		II	M	E
	80+00	1.72	80	83	34.0	0.00080	8.0	0.01	3.7	1.5:1	0.045	0.025	1.65	2.97		II	M	E
	0+00	3.08	110	112	31.4	0.00020	12.0	0.03	5.0	1.5:1	0.040	0.025	1.15	1.84	47990	II	M	E
L-1B	123+02	0.25	16	16	42.3	0.00150	5.0	0.18	1.6	1.5:1	0.045	0.025	1.36	2.45		II	M	E
	100+00	0.51	29	29	38.8	0.00150	3.0	0.18	2.2	1.5:1	0.045	0.025	1.61	2.90		II	M	E
	70+68	0.97	50	52	37.3	0.00040	8.0	0.09	3.5	1.5:1	0.045	0.025	1.13	2.03		II	M	E
	0+00	1.99	90	93	33.5	0.00040	8.0	0.06	4.4	1.5:1	0.040	0.025	1.44	2.30	23590	II	M	E
L-1C	50+00	0.14	5	6	33.5	0.00010	6.0	0.10	1.8	1.5:1	0.045	0.025	0.39	0.70		II	M	E
	39+53	0.25	11	12	33.4	0.00010	6.0	0.10	2.6	1.5:1	0.045	0.025	0.47	0.85		II	M	E
	0+00	0.66	34	34	32.6	0.00010	8.0	0.06	3.9	1.5:1	0.040	0.025	0.64	1.02	8250	II	M	E
L-1D	166+00	0.33	20	20	42.4	0.00010	6.0	0.03	3.4	1.5:1	0.045	0.025	0.53	0.95		II	M	E
	141+70	0.58	32	33	42.1	0.00010	10.0	0.02	3.6	1.5:1	0.045	0.025	0.59	1.06		II	M	E
	23+90	2.60	108	110	38.3	0.00025	10.0	0.03	5.0	1.5:1	0.040	0.025	1.26	2.02		II	M	E
	0+00	3.83	150	150	37.7	0.00025	15.0	0.03	5.0	1.5:1	0.040	0.025	1.33	2.13	31930	II	M	E
L-1D-1	38+00	0.80	42	49	39.0	0.00015	8.0	0.02	4.1	1.5:1	0.040	0.025	0.85	1.36		II	M	E
	20+00	0.93	48	49	38.7	0.00015	8.0	0.02	4.1	1.5:1	0.040	0.025	0.85	1.36	1710	II	M	E
	10+00	1.02	52	54	38.6	0.00015	A= 77.00		P= 33.00		0.045	0.025	0.70	1.26		IV	M	E
	0+00	1.11	56	56	38.4	0.00015	A= 98.00		P= 37.00		0.060	0.060	0.57	0.57		VI	M	E
L-1D-2	20+07	0.36	22	22	43.8	0.00060	4.0	0.10	2.6	1.5:1	0.045	0.025	1.08	1.94		II	M	E
	0+00	0.56	32	34	42.1	0.00060	4.0	0.10	3.2	1.5:1	0.045	0.025	1.20	2.16	2390	II	M	E
L-1E	70+90	0.47	26	28	42.9	0.00025	6.0	0.06	3.2	1.5:1	0.045	0.025	0.82	1.48		II	M	E
	36+74	0.90	41	40	41.8	0.00025	6.0	0.06	3.8	1.5:1	0.045	0.025	0.90	1.62		II	M	E
	0+00	1.30	53	55	40.5	0.00025	8.0	0.03	3.9	1.5:1	0.040	0.025	1.01	1.62	17820	II	M	E
L-1F	107+50	0.30	19	19	42.9	0.00015	6.0	0.03	3.0	1.5:1	0.045	0.025	0.61	1.10		II	M	E
	85+25	0.38	23	23	42.6	0.00015	6.0	0.03	3.3	1.5:1	0.045	0.025	0.64	1.15		II	M	E
	69+30	1.36	197 [2]	197	43.6	0.00030	12.0	0.05	6.0	1.5:1	0.040	0.025	1.56	2.50		II	M	E
	0+00	2.51	301 [2]	302	41.0	0.00030	12.0	0.04	7.0	1.5:1	0.035	0.022	1.92	2.99	23360	II	M	E
L-1F-1	16+14	0.11	36 [2]	37	45.4	0.00050	4.0	0.14	3.5	1.5:1	0.045	0.025	1.15	2.07		II	M	E
	11+80	0.14	42 [2]	42	45.2	0.00050	4.0	0.14	3.7	1.5:1	0.045	0.025	1.19	2.14		II	M	E
	0+00	0.29	69 [2]	70	44.6	0.00050	4.0	0.14	4.7	1.5:1	0.045	0.025	1.35	2.43	1030	II	M	E
L-1G	59+10	0.68	37	39	39.0	0.00050	8.0	0.07	2.8	1.5:1	0.045	0.025	1.13	2.03		II	M	E
	33+50	1.10	55	56	37.7	0.00050	8.0	0.07	3.4	1.5:1	0.045	0.025	1.25	2.25		II	M	E
	0+00	2.04	93	94	36.0	0.00050	8.0	0.08	4.2	1.5:1	0.040	0.025	1.57	2.51	13440	II	M	E
M-2	401+25	0.41	23	26	47.1	0.00085	4.0	0.11	2.6	1.5:1	0.045	0.025	1.28	2.30		II	M	E
	375+00	0.72	36	38	44.9	0.00085	8.0	0.11	3.1	1.5:1	0.045	0.025	1.40	2.52		II	M	E
	290+00	2.28	102	102	42.7	0.00020	8.0	0.04	5.2	1.5:1	0.045	0.025	1.25	2.25		II	M	E
	200+00	6.82	258	350	40.5	0.00025	A= 200.00		P= 48.00		0.035	0.022	1.75	2.72		IV	M	E
	120+00	9.54	324	391	38.6	0.00050	A= 209.00		P= 45.00		0.035	0.022	1.87	2.91		IV	M	I
	40+00	13.91	435	437	38.2	0.00050	30.0	0.04	8.2	1.5:1	0.027	0.020	1.26	1.70		II	M	I
	0+00	25.21	786	803	38.1	0.00050	40.0	0.04	9.5	1.5:1	0.025	0.020	1.56	1.95	92360	II	M	I
L-2B	93+50	1.13	50	57	44.7	0.00030	8.0	0.04	3.8	1.5:1	0.042	0.025	1.10	1.85		II	M	E
	79+00	1.47	58	60	44.3	0.00030	8.0	0.04	3.9	1.5:1	0.040	0.025	1.11	1.78		II	M	E
	60+00	1.28	64	66	43.7	0.00030	A= 63.00		P= 25.00		0.045	0.025	1.05	1.89		IV	M	E
	10+00	1.88	75	76	42.4	0.00030	8.0	0.04	4.3	1.5:1	0.040	0.025	1.23	1.97	10180	II	M	E
	0+00	2.11	85	87	41.9	0.00030	A= 70.00		P= 26.00		0.040	0.025	1.24	1.98		IV	M	E

1/ See Attached "Coding System for Inventory of Channel Work"
2/ Urban Protection

(continued)
Table 3 - Structure Data Channels
Kinder Watershed, Louisiana

Channel	Station	Drainage Area	Capacity Req'd	Capacity Des.	Water Surf. Elev.	Hydr. Grad.	Channel Dimensions Bottom Width	Channel Dimensions Bottom Grade	Channel Dimensions Flow Depth	Channel Dimensions Side Slope	"n" Value Aged	"n" Value As Built	Velocities Aged	Velocities As Built	Excavation	Inventory of Chan. Work 1/ Type of Work	Type Chan. Before Proj.	Flow Cond. Before Proj.
		sq mi	cfs	cfs		ft/ft	ft	%	ft				fps	fps	cu yd			
L-5A	335+00	1.09	35	38	59.9	0.00075	6.0	0.10	2.8	1.5:1	0.045	0.025	1.32	2.38		II	O	E
	310+00	1.34	39	41	58.0	0.00075	6.0	0.10	2.9	1.5:1	0.045	0.025	1.35	2.43		II	O	E
	250+00	4.38	118	121	53.5	0.00075	8.0	0.10	4.3	1.5:1	0.040	0.025	1.94	3.10		II	O	E
	114+00	6.43	180	180	48.1	0.00040	10.0	0.05	5.7	1.5:1	0.040	0.025	1.70	2.72		II	M	E
	94+00	7.08	202	205	47.3	0.00040	12.0	0.05	5.7	1.5:1	0.040	0.025	1.75	2.80		II	M	E
	50+50	9.03	260	318	45.5	0.00040	14.0	0.04	6.3	1.5:1	0.035	0.022	2.15	3.34	162315	II	M	E
	20+00	10.39	300	339	44.3	0.00040	A= 156.00		P= 38.00		0.035	0.022	2.17	3.38		IV	M	E
L-5A-1	116+00															II	M	E
	0+00	2.27			Estimated										44726	II	M	E
L-5A-2	83+00															II	M	E
	0+00	0.99			Estimated										32003	II	M	E
L-5A-3	38+00															II	M	E
	0+00	0.77			Estimated										14652	II	M	E
L-5B	250+00	0.55	15	17	55.6	0.00060	4.0	0.10	2.1	1.5:1	0.045	0.025	0.96	1.73		II	O	E
	200+00	0.68	19	20	52.6	0.00060	4.0	0.10	2.3	1.5:1	0.045	0.025	1.00	1.80		II	O	E
	180+00	1.93	60	65	51.4	0.00060	6.0	0.07	3.9	1.5:1	0.045	0.025	1.41	2.54		II	M	E
	80+00	3.36	108	111	46.6	0.00045	6.0	0.06	5.1	1.5:1	0.040	0.025	1.59	2.54		II	M	E
	20+00	5.67	175	177	44.0	0.00045	8.0	0.06	5.9	1.5:1	0.040	0.025	1.78	2.85	46960	II	M	E
L-5B-1	47+00															II	M	E
	0+00	1.47			Estimated										18122	II	M	E
M-6	208+00	0.99	43	45	57.8	0.00060	8.0	0.07	2.9	1.5:1	0.045	0.025	1.26	2.27		II	M	E
	137+00	1.54	65	68	53.5	0.00060	8.0	0.07	3.6	1.5:1	0.045	0.025	1.41	2.54		II	M	E
	70+00	2.96	103	103	49.5	0.00060	8.0	0.07	4.2	1.5:1	0.040	0.025	1.72	2.75	28530	II	M	E
	30+00	3.46	117	1800	47.1	0.00060	A=1134.00		P= 268.00		0.060	0.060	1.59	1.59		VI	M	E
L-6B	58+00	0.20	14	14	56.8	0.00020	4.0	0.05	2.7	1.5:1	0.045	0.025	0.63	1.13		II	O	E
	20+00	0.46	22	22	56.0	0.00020	4.0	0.05	3.4	1.5:1	0.045	0.025	0.72	1.30	15170	II	O	E
L-2C	116+50	0.42	25	25	43.3	0.00020	6.0	0.06	3.2	1.5:1	0.045	0.025	0.73	1.31		II	M	E
	0+00	1.88	86	88	41.0	0.00020	8.0	0.04	5.1	1.5:1	0.045	0.025	1.10	1.98	14810	II	M	E
L-2D	175+00															II	M	E
	116+84															II	M	E
	80+00															IV	M	E
	45+00															II	M	E
	0+00	2.59			Estimated										67475	IV	M	E
L-2D-1	14+00															II	M	E
	0+00	0.04			Estimated										5398	II	M	E
L-2E	34+00															II	M	E
	0+00	1.29			Estimated										13109	II	M	E
L-2E-1	35+00															II	M	E
	0+00	0.59			Estimated										13495	II	M	E
M-3	84+00	0.37	23	25	38.3	0.00060	6.0	0.07	2.4	1.5:1	0.045	0.025	1.10	1.98		II	M	E
	40+00	0.70	36	34	35.6	0.00060	6.0	0.07	2.8	1.5:1	0.045	0.025	1.19	2.14	3810	II	M	E
	36+00	0.70	36	50	35.4	0.00060	A= 100.00		P= 134.00		0.060	0.060	0.50	0.50		VI	N	E
	0+00	0.92	42	560	30.0	0.00150	A= 286.00		P= 98.00		0.060	0.060	1.96	1.96		VI	N	E
M-4	54+00	2.46	108	121	35.0	0.00100	6.0	0.10	4.4	1.5:1	0.040	0.025	2.19	3.50		II	M	E
	35+00	2.58	113	121	33.1	0.00100	6.0	0.10	4.4	1.5:1	0.040	0.025	2.19	3.50	1860	II	M	E
	15+00	2.72	117	594	32.1	0.00050	A= 571.00		P= 222.00		0.060	0.060	1.04	1.04		VI	M	E
	0+00	2.81	121	268	31.9	0.00010	A= 571.00		P= 222.00		0.060	0.060	0.47	0.47		VI	M	E
M-5	596+00	0.68	23	24	58.4	0.00030	4.0	0.04	3.2	1.5:1	0.045	0.025	0.85	1.53		II	O	E
	450+00	1.44	41	42	53.9	0.00030	4.0	0.04	4.2	1.5:1	0.045	0.025	0.98	1.76		II	O	E
	353+32	2.07	57	58	48.6	0.00055	4.0	0.06	4.2	1.5:1	0.045	0.025	1.33	2.39		II	O	E
	317+75	2.66	75	79	46.6	0.00055	4.0	0.06	4.7	1.5:1	0.045	0.025	1.51	2.72		II	O	E
	270+00	3.44	97	99	44.0	0.00055	4.0	0.06	5.1	1.5:1	0.040	0.025	1.67	2.67		II	M	E
	229+50	3.74	108	106	43.2	0.00020	8.0	0.03	5.6	1.5:1	0.040	0.025	1.16	1.86		II	M	E
	150+50	11.02	302	307	41.6	0.00020	12.0	0.03	7.8	1.5:1	0.035	0.022	1.66	2.58	133365	II	M	E
	115+00	21.88	543	825	40.9	0.00020	A= 375.00		P= 67.00		0.030	0.020	2.20	3.30		IV	M	E
	37+00	24.09	587	626	39.3	0.00020	A= 478.00		P= 66.00		0.060	0.060	1.31	1.31		VI	M	I
M-7	256+00	0.70	40	40	45.5	0.00025	6.0	0.09	3.8	1.5:1	0.045	0.025	0.90	1.62		II	M	E
	252+50	1.69	77	80	45.4	0.00025	8.0	0.04	4.6	1.5:1	0.040	0.025	1.17	1.87		II	M	E
	143+50	3.29	120	182	42.7	0.00025	A= 134.00		P= 38.00		0.040	0.025	1.36	2.18	26000	II	M	E
	100+00	3.29	120	390	36.2	0.00149	A= 474.00		P= 276.00		0.100	0.100	0.82	0.82		VI	M	I
	90+00	3.86	123	548	34.7	0.00149	A= 563.00		P= 254.00		0.100	0.100	0.97	0.97		VI	M	I
	40+00				34.2	Calcasieu River Flood Plain										VI	N	I
L-7A	50+00	0.20	11	39	47.5	0.00050	4.0	0.06	3.6	1.5:1	0.045	0.025	1.17	2.11		II	O	E
	20+00	0.71	36	39	46.0	0.00050	4.0	0.06	3.6	1.5:1	0.045	0.025	1.17	2.11	4000	II	O	E

1/ See Attached Coding System for Inventory of Channel Work

Coding System for Inventory of Channel Work

Type of Work	I -	establishment of new channel including necessary stabilization measures
	II -	enlargement or realignment of existing channel or stream
	III -	cleaning out natural or manmade channel (includes bar removal and major clearing and snagging operation)
	IV -	clearing and removal of loose debris within channel section
	V -	stabilization, by continuous treatment or treatment of localized problem areas, as primary purpose (present capacity adequate)
	VI -	adequate
Type of channel Prior to Project	N -	an unmodified, well-defined natural channel or stream
	M -	manmade ditch or previously modified channel
	O -	none or practically no defined channel
Flow Condition Prior to Project	Pr -	perennial - flows at all times except during extreme drought
	I -	intermittent - continuous flow through some seasons of the year but little or no flow through other seasons
	E -	ephemeral - flows only during periods of surface runoff
	S -	ponded water with no noticeable flow, caused by lack of outlet or high ground-water level

TABLE 4 - ANNUAL COST

Kinder Watershed, Louisiana

(Dollars)1/

Evaluation Unit	Amortization of: Installation Cost 2/	Operation and Maintenance Cost	Total
I	39,800	9,000	48,800
II	1,100	500	1,600
III	21,600	6,100	27,700
IV	38,100	10,400	48,500
V	2,100	1,300	3,400
Project Administration	12,900	xxx	12,900
TOTAL	115,600	27,300	142,900

1/ Price base 1974.

2/ Fifty years at 5.625 percent interest.

May 1974

TABLE 5 - ESTIMATED AVERAGE ANNUAL FLOOD DAMAGE REDUCTION BENEFITS

Kinder Watershed, Louisiana

(Dollars)1/

Item	Estimated Average Annual Damage: Without Project	Estimated Average Annual Damage: With Project	Damage Reduction Benefit
Floodwater			
Agricultural			
Crop and Pasture	307,000	82,000	225,000
Nonagricultural			
Road	11,800	3,100	8,700
Subtotal	318,000	85,100	233,700
Indirect	16,500	4,400	12,100
TOTAL	335,300	89,500	245,800

1/ Price base - Agricultural, 1974 Current Normalized.
Nonagricultural 1974.

May 1974

TABLE 6 - COMPARISON OF BENEFITS AND COSTS FOR STRUCTURAL MEASURES

Kinder Watershed, Louisiana

(Dollars)

Evaluation Unit	Average Annual Benefits 1/						Average Annual Cost 2/	Benefit Cost Ratio
	Damage Reduction	More Intensive Land Use	Drainage	Redevelopment	Secondary	Total		
I	98,100	20,000	89,700	6,500	35,000	249,300	48,800	5.1:1
II	4,000	900	3,800	200	1,100	10,000	1,600	6.3:1
III	64,000	13,200	59,800	2,700	28,000	167,700	27,700	6.5:1
IV	73,700	14,800	66,000	5,600	23,800	183,900	48,500	3.8:1
V	6,000	1,300	5,700	400	2,200	15,600	3,400	4.6:1
Project Administration	xxx	xxx	xxx	xxx	xxx	xxx	12,900	
GRAND TOTAL	245,800	50,200	225,000	15,400	90,100	626,500	142,900	4.4:1

1/ Current normalized prices for crop and pasture, 1974 prices for all other values.

2/ From table 4.

May 1974

INVESTIGATIONS AND ANALYSES

Land Treatment

The conservation needs inventory for Allen and Jefferson Davis Parishes, published by the U.S. Department of Agriculture under the leadership of the Soil Conservation Service, provided information on capability classes of soils and land use. Agricultural workers in the parishes also supplied information about soils and land use. With this information and the technical guides, the land treatment needs for the watershed were developed.

Conservation measures applied to date were determined from farm operators and from a study of field office records. This information was used in preparing table 1A.

Conservation measures to be applied during the installation period were determined after careful consideration of the following factors:

1. Soil potential for alternative land uses
2. Basic needs of the watershed from a land treatment standpoint
3. Personnel available for planning in the field office
4. Experience gained from the installation of other projects
5. Interviews with farm operators regarding their resources, desires, and willingness to install needed land treatment measures.

Engineering Investigations

The following studies were made to determine the structural measures which would be installed:

1. U.S. Geological Survey quadrangle maps were used as a base in preparing a planning map showing the watershed boundary, proposed channels, drainage patterns, systems of roads, and other pertinent data.

2. Floodwater retarding structures were considered but found inapplicable since the topography does not lend itself to that type of measure.

3. The Sponsors agreed upon the locations of channels they wished investigated.

4. Designs were made on these channels which would provide 1.5-year 3-year, and 5-year levels of protection. Designs and cost estimates were developed for each of the three levels of protection.

5. The cost of diverting the flow from Channel M-2 through a by-pass for approximately 2.3 miles was evaluated.

6. The environmental effects of construction in relation to benefits were evaluated on Stines Creek.

7. Alternate designs and evaluations were made on Channel M-7 in an effort not to disturb a colony of red-cockaded woodpeckers.

8. With assistance from the local Sponsors, the watershed was divided into several areas of priority. The first priority is that area in greatest need of immediate attention. This is the area drained by Channel M-1 and all of its laterals (figure 4). Sufficient surveys and designs to allow an invitation for bids and preparation of land rights maps were made for this area.

The following abbreviated survey procedure was used on the remaining areas:

Field surveys were made on a representative sample of the remaining channels. Designs and cost estimates for the surveyed channels were developed. Design flow for channel work was computed from general formulae as described under "Hydraulic and Hydrologic Investigations." Costs of the unsurveyed channels were estimated based upon the surveyed channels and other watersheds with similar characteristics.

The design "n" values for "aged" channels range from .025 to .045 depending on the value of the hydraulic radius as shown in the following tabulation:

HYDRAULIC RADIUS	"n"
Less than 2.5	0.040 - 0.045
2.5 to 4.0	.035 - .040
4.0 to 5.0	.030 - .035
More than 5.0	.025 - .030

The "n" values for "as built" channels range from 0.020 - 0.025. All channels have been designed to meet the criteria for stability in Technical Release 25 taking into account allowable flow velocities in view of soil materials present.

The existing drainage system has been extended and modified periodically. However, only a small number of main channels have been dug in recent years. In areas where project channels will outlet through these old channels, the outlets were investigated to determine their stability. Channels were designed so that excavation will be terminated prior to entering erodible outlet sections. Outlet sections that are covered with natural vegetation and show no evidence of active erosion were considered safe and stable if no additional drainage area was added.

Estimated unit costs of structural measures were based on the going rate of similar work in the general area with adjustment for special conditions. Land rights maps for all channels in the area of highest priority were prepared. Detailed locations of channels in the remaining priority areas will be made during the operations stage of the project.

The local Sponsors furnished ownership information. The locations of the proposed channels were checked against the ownership map to eliminate channels benefiting only one ownership or resulting, primarily, in bringing new land into agricultural production.

After the land treatment measures and those structural measures needed for flood prevention and drainage had been determined, a table was developed which gave the cost of each measure. The summation of the total costs for all needed measures represents the estimated installation costs of the project (table 1). A second table was developed to show the annual costs of installation and operation and maintenance of the structural measures (table 4). Pertinent physical data for individual structural measures are summarized in table 3.

Geologic Investigations

Channel Stability - Studies were conducted in accordance with accepted Soil Conservation Service Procedure. Determination of channel stability was based on the "allowable velocity" approach as developed by several authors including S. F. Fortier, F. C. Scobey, and E. W. Lane. The Russian publication, "Standards for Permissible Non-eroding Velocities"; Bureau of the Methodology of the Hydro-Energo Plan; Gidrotekhniches Koy Stroitel'stvo, Obedinennoe Nanchno-Teknicheskoe 12 dated 'stvo., Moscow, USSR, May, 1936, outlines a similar method.

Channel stability investigations were conducted by sampling material at selected points of typical channels and then analyzing this material. Channels M-1, M-2 and M-5 were considered to be representative of the area. Samples from three holes on Channel M-5 were analyzed. These holes were located at the lower end, the middle, and the upper end of the channel. The materials ranged from a nonplastic ML to a CL with a liquid limit of 40 and a plasticity index of 24. Samples from three holes on M-2, located in the same manner, ranged from CH to a CL-ML. Materials ranged from a ML to a CL on Channel M-1.

Borings were made in the vicinity of all proposed structures for water control and their designs were based on the materials encountered. These materials were taken into consideration when estimating costs of structures for water control.

Sedimentation - Sheet erosion was calculated by use of the Musgrave Equation. This equation states that $E = FR \left(\frac{S}{10}\right)^{1.35} \left(\frac{L}{72.6}\right)^{.35} \left(\frac{P_{30}}{1.375}\right)^{1.75}$

E = Sheet erosion, tons per acre per year
F = Soil factor, basic erosion rate in tons per acre per year for each soil series or unit
R = Cover factor
S = Slope in feet per 100 feet
L = Length of slope in feet
P_{30} = Maximum 30-minute, 2-year frequency rainfall in inches

For a discussion on the background of this formula see page 41 of "Applied Sedimentation," edited by P. D. Trask.

For purposes of computing sedimentation, each evaluation unit was analyzed separately. This allowed a more definitive approach as to delivery ratios and downstream effects.

Present cover factors were based on observation and records as to amounts and types of land treatment measures that had been applied. Future without project cover factors were estimated based on the rate of increase of application of land treatment measures. Project cover factors were based on the accelerated rate of application of land treatment measures necessary to achieve the objectives of the plan. This will be accomplished by accelerated technical assistance.

The sediment yields to specific points were calculated on a sediment delivery ratio. This ratio is based primarily on drainage area and its accuracy has been established through sedimentation surveys. Trap efficiency of the structures for water control (weirs) was estimated on the basis of location, grain size, and previous sedimentation surveys conducted by the Agricultural Research Service and the Soil Conservation Service.

Suspended sediment was estimated on the basis of average annual sediment rate and average annual runoff. The amount of channel bank erosion which will occur due to construction was estimated on the basis of the type of material being disturbed, the size of the channel, the method of construction, and the vegetative practices which are being instituted as part of the construction plan. A sequence of construction has been selected so that the reduction in sediment due to land treatment and structural measures will exceed the amount of erosion instigated by construction.

Ground Water and Mineral Resources - Investigations consisted of a review of pertinent literature. The following is a list of publications used:

1. Geology of Beauregard and Allen Parishes, Geological Bulletin No. 27. Published by the Department of Conservation, Louisiana Geological Survey, Baton Rouge, Louisiana, May 1950.

2. Geology and Ground Water Resources of Southwestern Louisiana, Geological Bulletin No. 30. Published by Department of Conservation, Louisiana Geological Survey, Baton Rouge, Louisiana, January 1954.

3. Ground Water Pumpage and Related Effects, Southwest Louisiana, 1970, Water Resources Pamphlet No. 27, by Allen L. Zack, U.S. Geological Survey, Published by Department of Conservation, Louisiana Geological Survey and Louisiana Department of Public Works, Baton Rouge, Louisiana, April 1971.

4. Ground Water for Louisiana's Public Supplies by J. L. Snider, M. D. Winner, Jr., J. B. Epstein, Published by Louisiana Department of Public Works, Baton Rouge, Louisiana, December 1962.

5. The Sand and Gravel Deposits of Louisiana, Geological Bulletin No. 19, by T. P. Woodward and Albert J. Gurno, Jr., Published by Department of Conservation, Louisiana Geological Survey, New Orleans, Louisiana, April 1, 1974.

Archaeological, Historic, and Scientific Sites - Scanning the "National Register of Historic Places" and written communication with the Curator of Anthropology of Louisiana State University revealed no known historic or archaeologic sites.

Hydraulic and Hydrologic Investigations

Basic data were assembled from the following sources:

1. U.S. Coast and Geodetic Survey quadrangle maps
2. Aerial photographs
3. U.S. Environmental Data Service rainfall frequency analyses
4. Field surveys of channels
5. U.S. Geological Survey streamflow records
6. Field observations
7. General soil maps
8. Land use inventory
9. Fish and wildlife assessments.

Hydraulic engineers determined the capacity of existing channels to carry storm runoff. Stage discharge relationships were determined at regular intervals along each channel. The estimates were made by

the slope-area method, using a "design" hydraulic gradient on each channel. Design gradients were set at elevations above which prolonged flooding causes damages. The elevations of design gradients at outlets into the Calcasieu River were determined by analyzing stream gage records near Kinder and Oberlin. Channel reaches were deemed adequate where the measured capacities below the design gradient equalled or exceeded the design flows.

Design flows were computed from the formula, $Q = CM^{5/6}$, where Q is the required capacity in cubic feet per second, C is a coefficient related to the level of protection desired, and M is the drainage area in square miles. Research and long-term observations by drainage engineers have verified the relationship between drainage area and required discharge. Recent research has indentified the relationship between "C" and storm runoff volume. This relationship was applied to the runoff volume of a 3-year storm to determine the required "C" value of 52 for open land and 25 for forest land. Project channels will reduce the frequency of damage to crops above the design gradient to an average of not more than once in 3 years. The peak flow of a 3-year storm will be out-of-banks, but the storm flow will not remain out-of-banks more than about 24 hours. Flooding of this duration will not cause significant crop damages.

The reduction in average annual damaging overbank flow to be effected by project channels varies with evaluation units. The reduction for each unit was estimated by using a curve constructed by plotting proportional runoff volumes as ordinates against probability. Proportional runoff volumes corresponding to PRESENT and WITH PROJECT probabilities of damaging overbank flooding were set as lower limits of area under the curve. These areas represent average annual damaging overbank flow volumes and were assumed to be proportional to average annual damages induced by water. The percent damage reductions varied with units due to differences in present levels of protection.

Land surfaces lower than the design gradients will flood more frequently and stay flooded longer than in the protected areas. The land use in the protected areas is predominantly crop and pasture; the land use in the unprotected areas is predominantly forest land. The flood risk in the unprotected areas will continue to discourage clearing of forest land.

Channel M-7 was designed to terminate work upstream from the normal habitat limits of the colony of red-cockaded woodpeckers.

The effect of channel work on downstream stages was computed at selected points below the project channels. Existing peak discharge frequencies were estimated by an empirical method.1/ Increases in peak discharges were estimated by a method using a graph developed by the U.S. Army Corps of Engineers.2/ The graph relates increase in peak flow to (1) the existing channel capacity relative to the peak flow, and (2) the relative increase in channel capacity. PRESENT and WITH PROJECT discharges at each point were applied to the stage-discharge relationship to obtain stage increases.

Forestry Investigations

A field survey by the Forest Service showed ground cover, forest, and hydrologic conditions and treatment needs. This survey, supporting data, and information from other agencies and forestry officials determined the amount of remedial measures needed. This was accomplished by defining the problems and measuring the resource potentials.

Fish and Wildlife Investigations

A field reconnaissance was made by biologists of the U.S. Fish and Wildlife Service, the Louisiana Wild Life and Fisheries Commission, and the Soil Conservation Service with the aid of aerial and topographic maps and other pertinent data provided by the Soil Conservation Service. Prior to visiting the area, the biologists made a map study and noted any high value aquatic and terrestrial habitat in the proximity of the proposed works. The habitat areas previously noted were studied.

Following the reconnaissance, the U.S. Fish and Wildlife Service prepared a report listing their findings and recommendations. This report was reviewed and concurred in by the Louisiana Wild Life and Fisheries Commission. Recommendations in their report for maintaining or improving fish and wildlife habitat are incorporated in this plan.

Preproject habitat conditions and populations of game and fish species were determined from a review of available literature, data provided by the Louisiana Wild Life and Fisheries Commission, and field investigations. Postproject populations were estimated after a determination was made of the habitat lost or gained because of project action.

1/ V. B. Sauer, Floods in Louisiana (2nd ed.; U.S. Geological Survey, 1964), pp. 11-21.

2/ "Alluvial Valley Area Peak Flow Increase Due to Channel Improvement," Document No. 04-08-12 (W.E.R., U.S. Army Corps of Engineers, May 1967).

Water quality data was collected with a Hach DR/2 Spectrophotometer and Hach pH and oxygen kits. Samples were collected at one sample station on each of three channels - Stines Creek, and Channels M-1 and M-5.

An inventory of wetland types and ponds was conducted. Wetland types were classified according to guidelines in USDI Circular No. 39. Ponds were classified by their use, e.g., multiple-use farm ponds and commercial catfish ponds. Project effects were also determined for wetland types and ponds.

A literature review and field investigations were made for rare or endangered species. One colony of red-cockaded woodpeckers was located near Channel M-7 and necessary precautions were taken during the planning stage to prevent any habitat changes in their home range.

Economic Investigations

The following data have been developed:

1. Estimated yields and production costs for crops and pasture grown under various conditions
2. Land use and production under future conditions both without and with the project.
3. Associated cost induced by the project
4. Increased net income from crops and pasture resulting from flood damage reduction and improved drainage
5. Increased returns due to increased quality of products
6. Reduction in crop production cost due to project
7. Road damage reduction due to the project
8. Secondary benefits stemming from or induced by the project.

Basic data were obtained from local farmers, agricultural workers, State and parish officials, experiment stations, other published and unpublished agricultural information, the 1970 U.S. Census of Population, and the 1969 Census of Agriculture. Parish statistics used were considered representative of the watershed.

The watershed was divided into six evaluation units according to hydrologic characteristics. The existing level of protection and the similarity of problems allowed grouping four different channels into two evaluation units. The Project Map (Figure 4) has Evaluation Units I-V delineated on it. All of the remaining land was investigated for problems. No problems were found which warranted project action, so this area was not labeled as an evaluation unit. The area is mostly forested and is adequately protected for its level of development. Within this area, the open land north of Stines Creek was investigated. It was not included for project works because of adverse environmental effects and an unfavorable benefit-cost ratio. Economic effects of the project shown in this plan reflect the results of the works in Evaluation Units I-V.

Estimates of present land use in the watershed were developed from field reconnaissance, aerial photographs, maps, records, and interviews. The present land use data were used to establish evaluation units. From the present land use, the FUTURE WITHOUT-PROJECT, and FUTURE WITH-PROJECT land uses were developed considering trends and data obtained from the previously mentioned sources.

Crop and pasture yields were developed from primary and secondary sources. Before damage schedules were obtained, sources of data such as the Louisiana Crop and Livestock Reporting Service reports and potential yields from Soil Survey Interpretations were used to check present yields and the potential yields for the area. Farmers and other agricultural personnel were then interviewed within the watershed to obtain (1) present average yields, (2) problem yields, and (3) nonproblem yields by evaluation units. The difference between nonproblem yields and average yields are the increases which could be attained with the project.

Two reports were used to project yields into the project evaluation period. One of these reports, Agricultural Land Resources, Their Productivity and Use, Lower Mississippi Region projects into the future crop yields by soil productivity groups. The other report, An Analysis of Trends in Yields of Major Field Crops in Louisiana, gives trends for certain crop yields by parishes. The yields calculated from these reports were considered to be future "maximum" yields. "Maximum" yields as used in this analysis does not denote the highest yield which could be attained by one particular producer during a certain cropping season. Rather, it means average yields attainable by all producers if technology and resource development continue to increase.

Future without-project yields were calculated by subtracting the difference in nonproblem and average yields from the future "maximum" yields. Future with-project yields were calculated by multiplying the difference in nonproblem and average yields by a "factor" and adding the resulting product to the future without-project yield. This "factor" is based on the improved carrying capacity of channels which reflect improved drainage and reduced flooding.

The project effect of lowering production costs for the main crops was calculated from a study of the production budgets. Production budgets were developed for the various crop and pasture operations for conditions expected in the future. These budgets were based on those of similar watersheds. However, they were revised using data such as fertilizer rate, types of operations, and trips per acre, which were obtained from farmers and research publications. Installation of the project will induce farmers to increase inputs such as fertilizer, and to practice better weed control. These increases in cost will be offset by the increased quality of products, reduction in applications of preplant herbicides, reduction in the number of replantings and land preparation operations, and increased timeliness and reduced cost of operations. Operation and maintenance cost of farm machinery and equipment will also be lowered.

Studies of crop and pasture production budgets indicate that benefits from more intensive use will be about 10 percent of the net crop and pasture benefits. Since flood prevention and drainage are inseparable, the more intensive use benefits were divided equally between these two purposes.

Production losses and other damages were computed by evaluation units. Estimated yields, productions costs, and current normalized prices for crops and pasture were used to calculate net returns for the PRESENT and the FUTURE WITHOUT and WITH PROJECT conditions. The studies show that the measures in each evaluation unit provided sufficient benefits to justify their inclusion. Similar data was developed to evaluate the several different alternatives indicated under the PROJECT FORMULATION section.

Secondary benefits were estimated and are expressed in this work plan; however, they were not needed for project justification. They were limited to local benefits stemming from or induced by project installation. Since there is no known research data available to estimate agriculture multiplier effects in Louisiana, secondary benefits on a regional basis were not calculated.

The local Sponsors, after consulting with realtors and landowners, furnished the estimated land easement values and the cost of obtaining these easements. These values were used in determining land rights costs.

The benefits claimed for project justification are net annual benefits. All production costs and associated costs have been deducted. Lag in accrual was considered in evaluating the benefits. Indirect damages were estimated to be 10 percent of the direct road floodwater damages and 5 percent of the direct agricultural flood damages. The costs of structural works of improvement were reduced to average annual cost to compare with project benefits. This comparison shows a 4.4 to 1.0 benefit-cost ratio. Structural measures were amortized for a 50-year period at 5.625 percent interest. This period is comparable to that of similar projects. Operation and maintenance costs were converted to annual estimates.

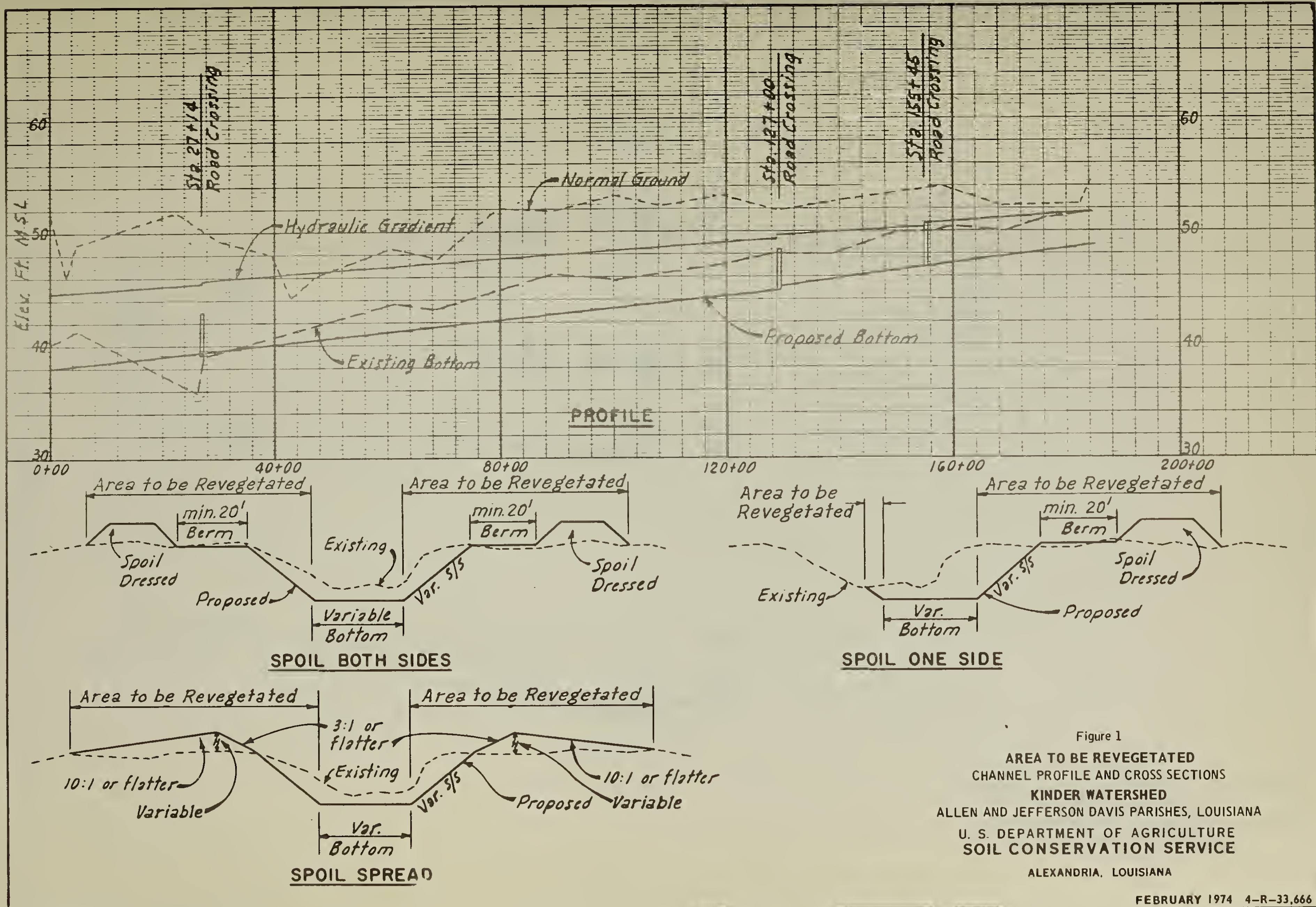

Figure 1

AREA TO BE REVEGETATED
CHANNEL PROFILE AND CROSS SECTIONS
KINDER WATERSHED
ALLEN AND JEFFERSON DAVIS PARISHES, LOUISIANA

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
ALEXANDRIA, LOUISIANA

FEBRUARY 1974 4-R-33,666

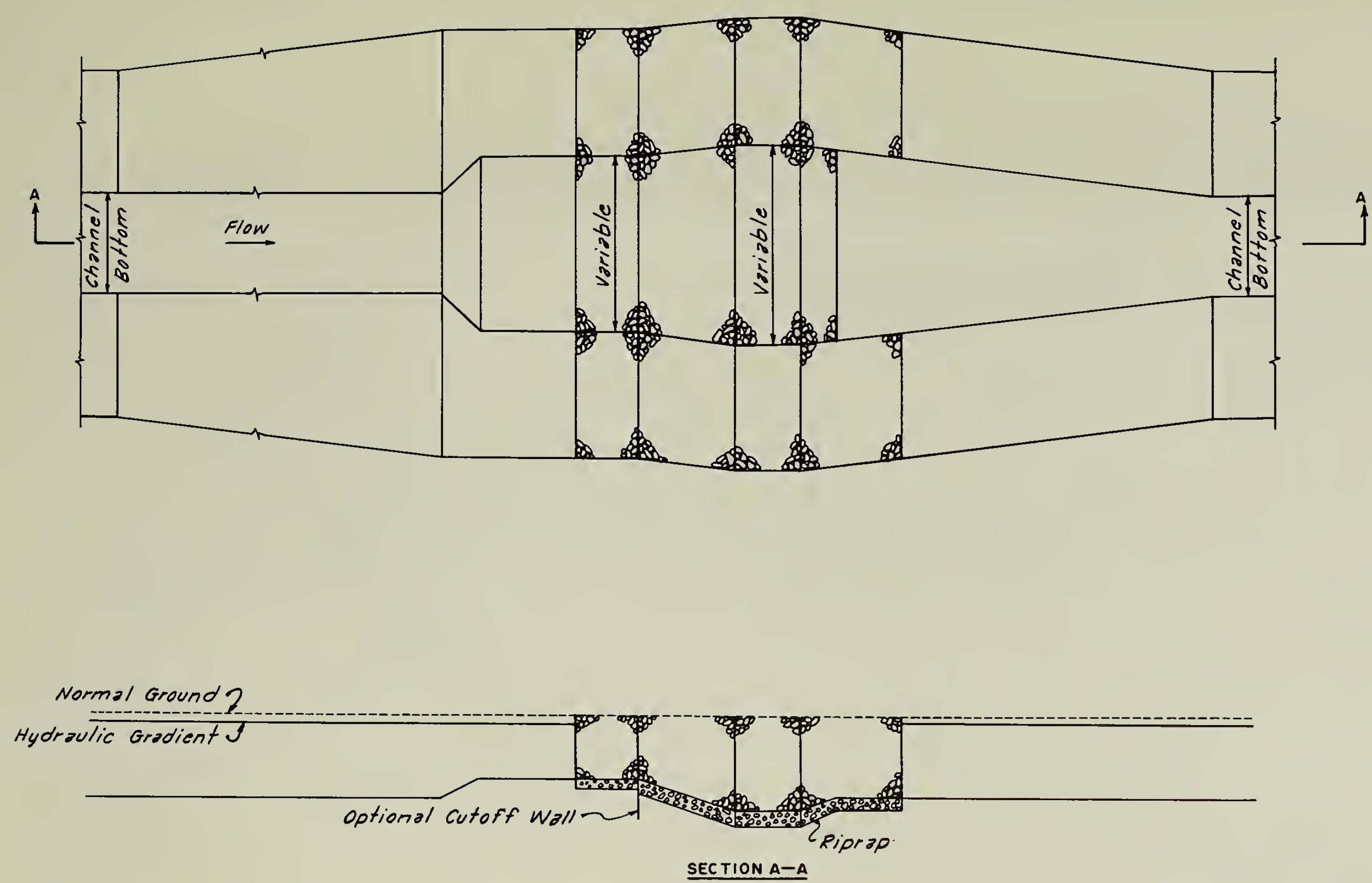

FIGURE 2
TYPICAL STRUCTURE FOR WATER CONTROL (WEIR)
KINDER WATERSHED
ALLEN AND JEFFERSON DAVIS PARISHES, LOUISIANA
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
ALEXANDRIA, LOUISIANA

Revised 7-74

FEBRUARY 1974 4-E-33,665

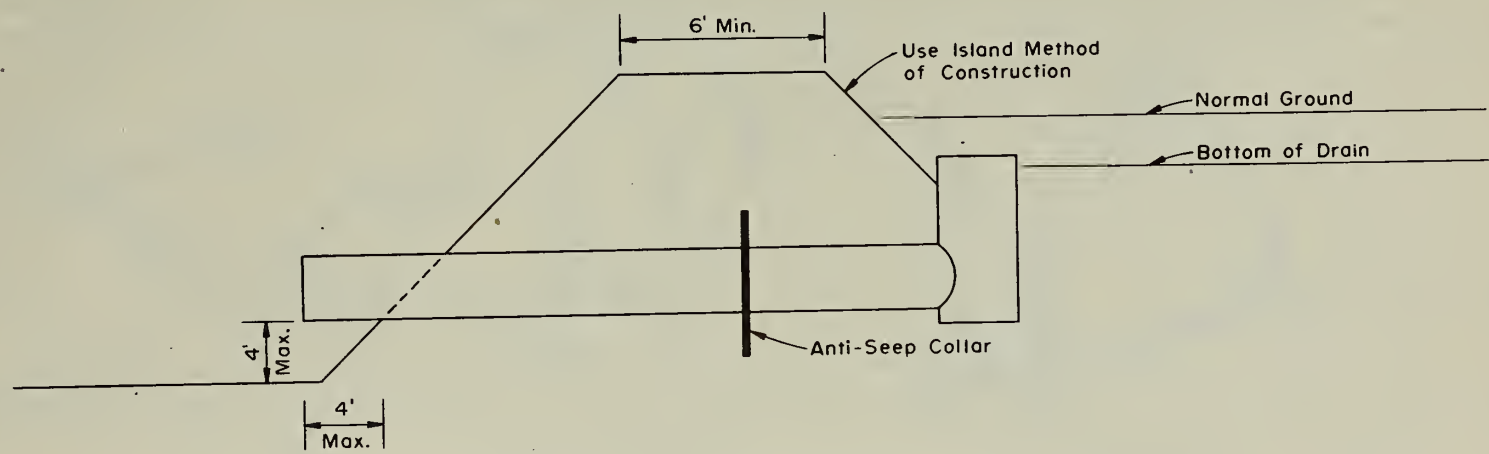

Figure 3

TYPICAL STRUCTURE FOR WATER CONTROL (PIPE DROP)

KINDER WATERSHED

ALLEN AND JEFFERSON DAVIS PARISHES, LOUISIANA

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
ALEXANDRIA, LOUISIANA

Revised 7-74 FEBRUARY 1974 4-R-33,667

USDA-SCS FORT WORTH, TEX. 1974

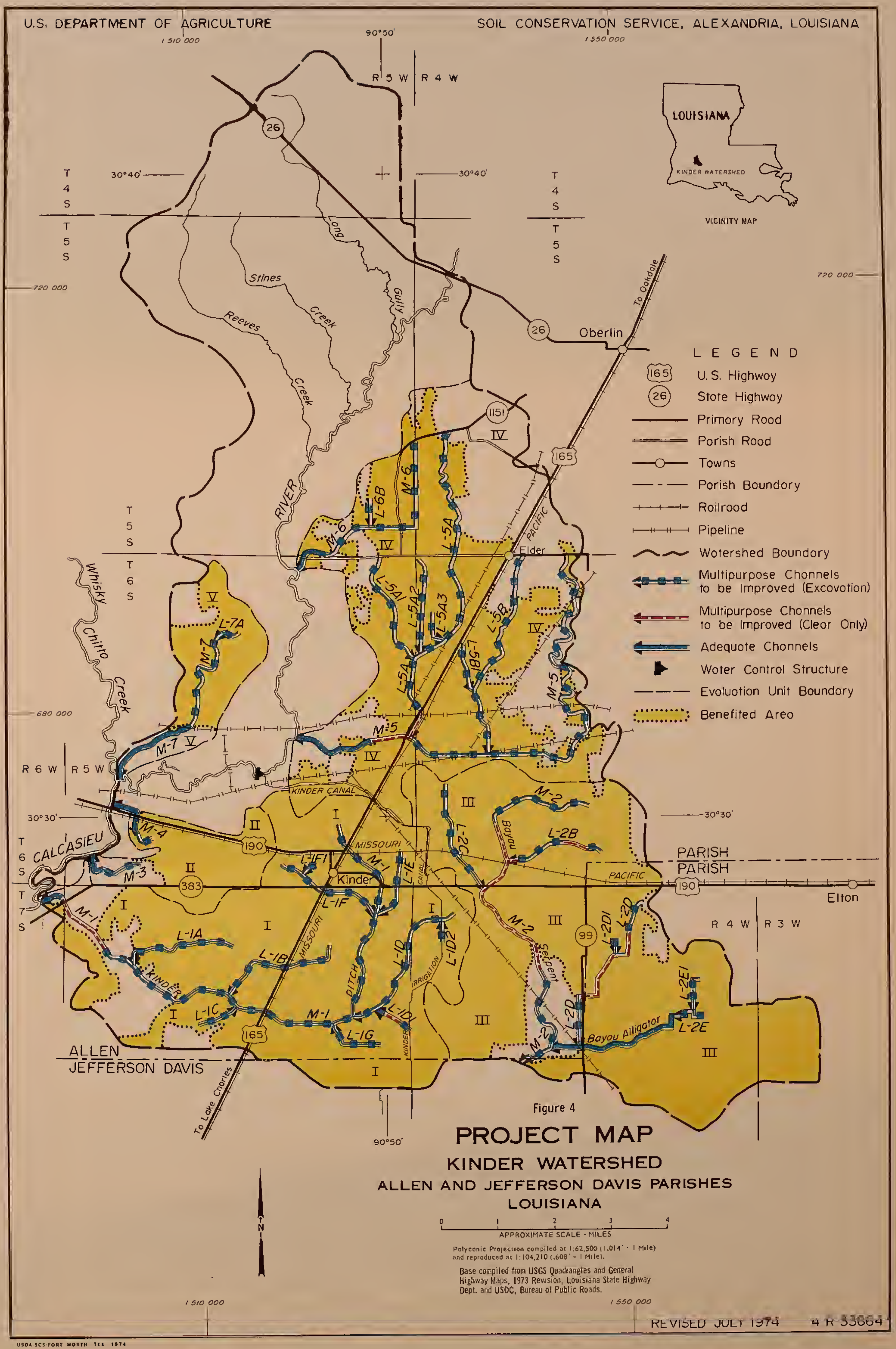

Figure 4

PROJECT MAP

KINDER WATERSHED

ALLEN AND JEFFERSON DAVIS PARISHES

LOUISIANA